US011927913B2

(12) **United States Patent**
Komatsu et al.

(10) **Patent No.: US 11,927,913 B2**
(45) **Date of Patent: Mar. 12, 2024**

(54) **CARTRIDGE UNIT**

(71) Applicant: **CANON KABUSHIKI KAISHA**, Tokyo (JP)

(72) Inventors: **Noriyuki Komatsu**, Shizuoka (JP); **Teruhiko Sasaki**, Shizuoka (JP); **Tomonori Mori**, Kanagawa (JP); **Makoto Hayashida**, Shizuoka (JP)

(73) Assignee: **CANON KABUSHIKI KAISHA**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/554,157**

(22) Filed: **Dec. 17, 2021**

(65) **Prior Publication Data**

US 2022/0107604 A1 Apr. 7, 2022

Related U.S. Application Data

(63) Continuation of application No. 17/126,498, filed on Dec. 18, 2020, now Pat. No. 11,237,519.

(30) **Foreign Application Priority Data**

Dec. 27, 2019 (JP) 2019-239498
Nov. 26, 2020 (JP) 2020-196038

(51) **Int. Cl.**
G03G 21/18 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1878*** (2013.01); ***G03G 21/1814*** (2013.01); *G03G 2221/1823* (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1878; G03G 21/1874
See application file for complete search history.

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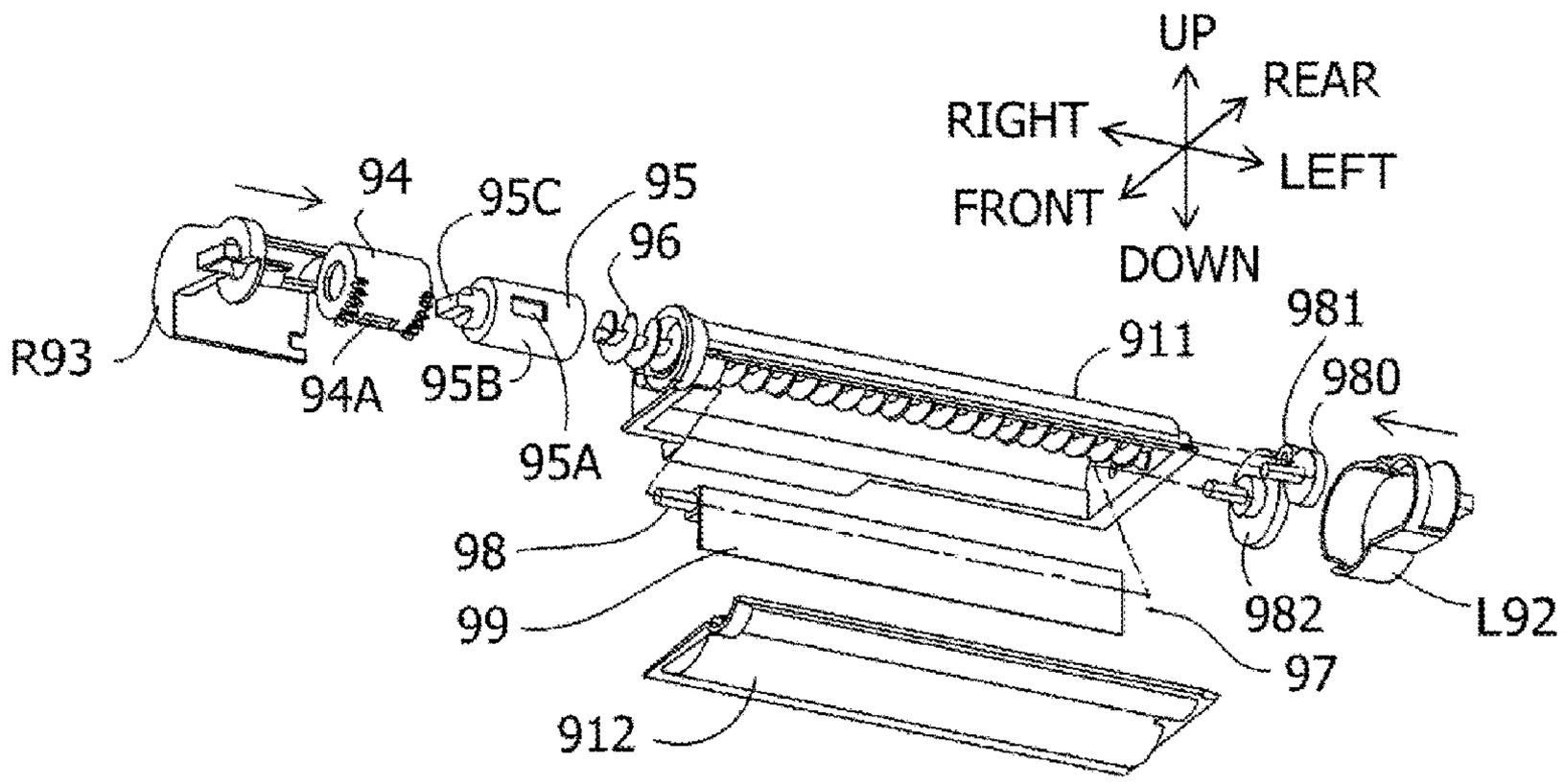
Primary Examiner — Victor Verbitsky
(74) *Attorney, Agent, or Firm* — ROSSI, KIMMS & McDOWELL LLP

(57) **ABSTRACT**

A cartridge unit includes: a first unit which includes a first supporting portion and a second supporting portion; and a second unit which includes a first supported portion, a second supported portion, and a storage member, the storage member including a memory contact, and a contact arrangement surface on which the memory contact is disposed. The second unit rotates from a first position to a second position in a state in which the first supported portion is supported by the first supporting portion and the second supported portion is supported by the second supporting portion to be positioned with respect to the first unit. A normal direction of the contact arrangement surface faces toward a direction in which the memory contact is exposed. The normal direction faces toward a direction opposite to a direction in which the second unit is directed from the first position to the second position.

20 Claims, 54 Drawing Sheets



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Notice of Allowance issued in U.S. Appl. No. 17/126,498 dated Sep. 29, 2021.

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FIG. 1

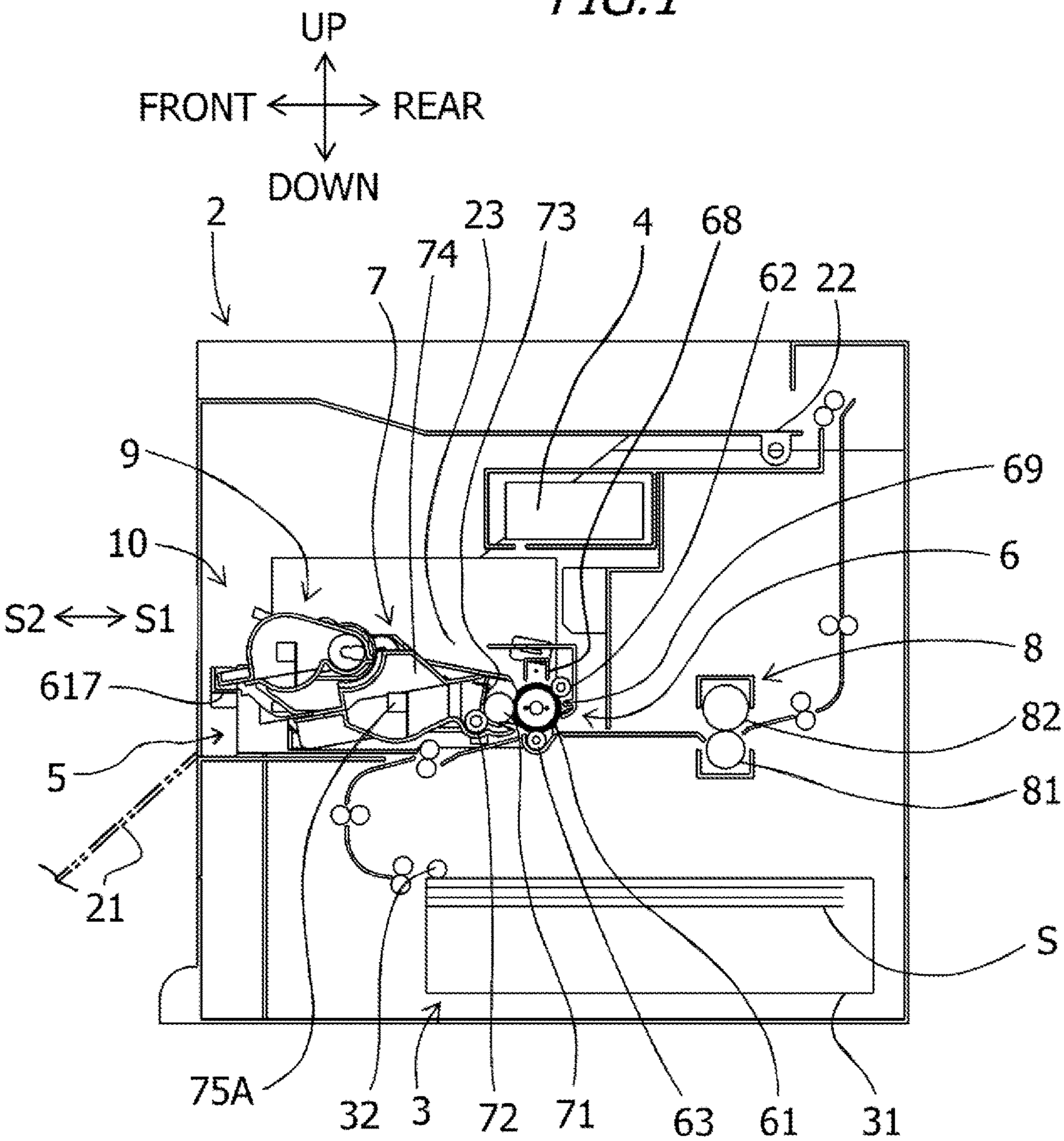
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FIG.2

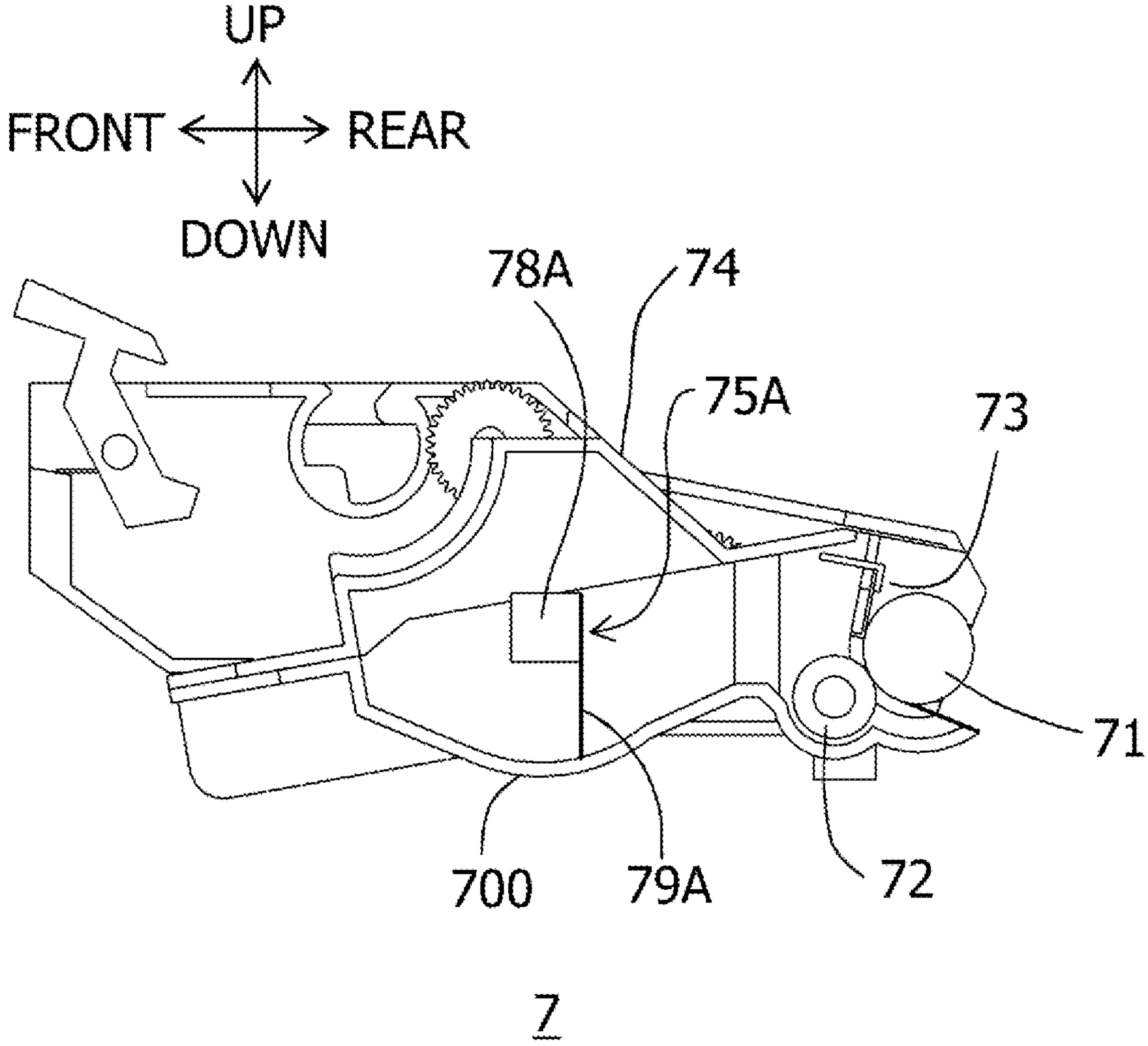

FIG.3

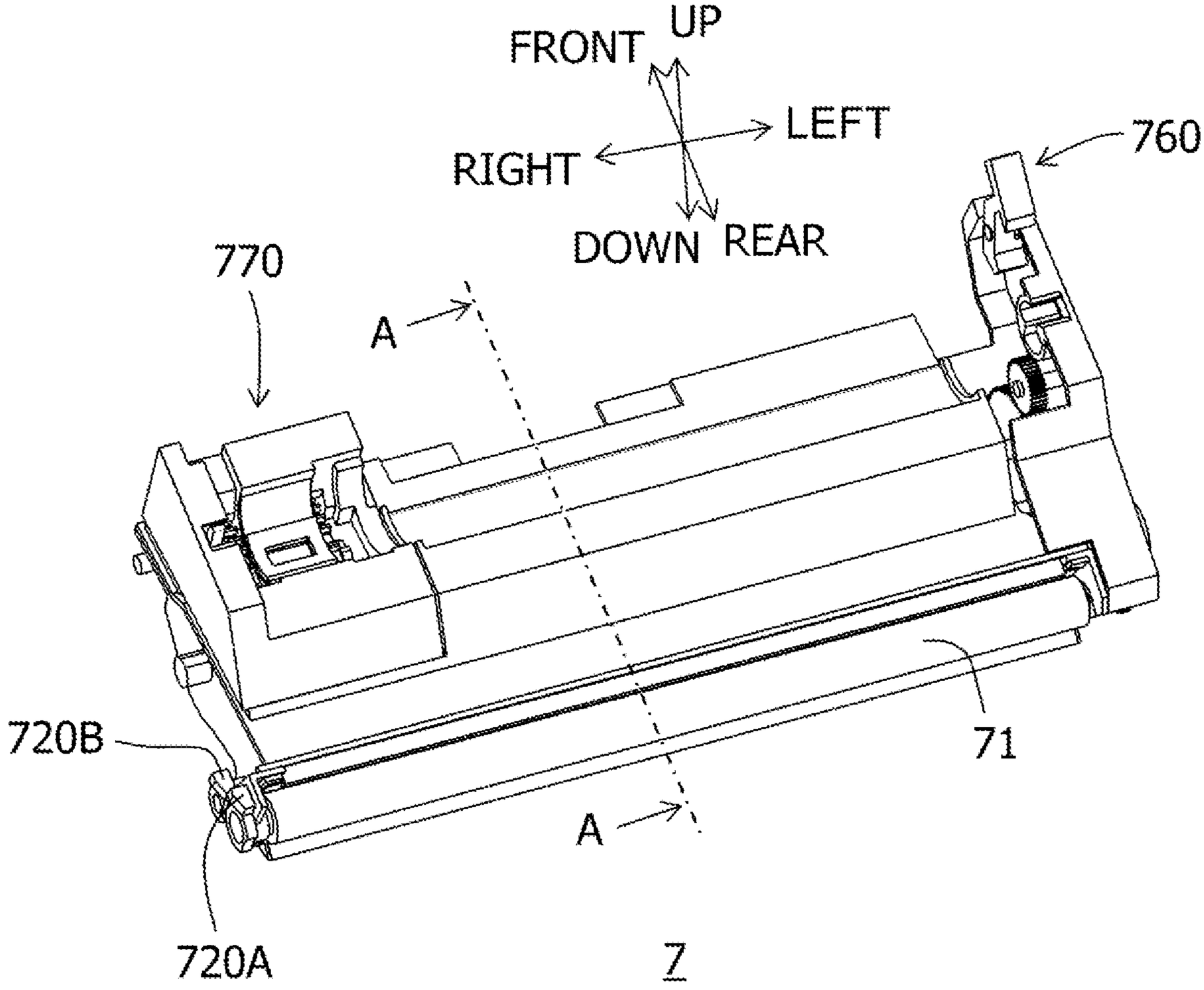

FIG. 4

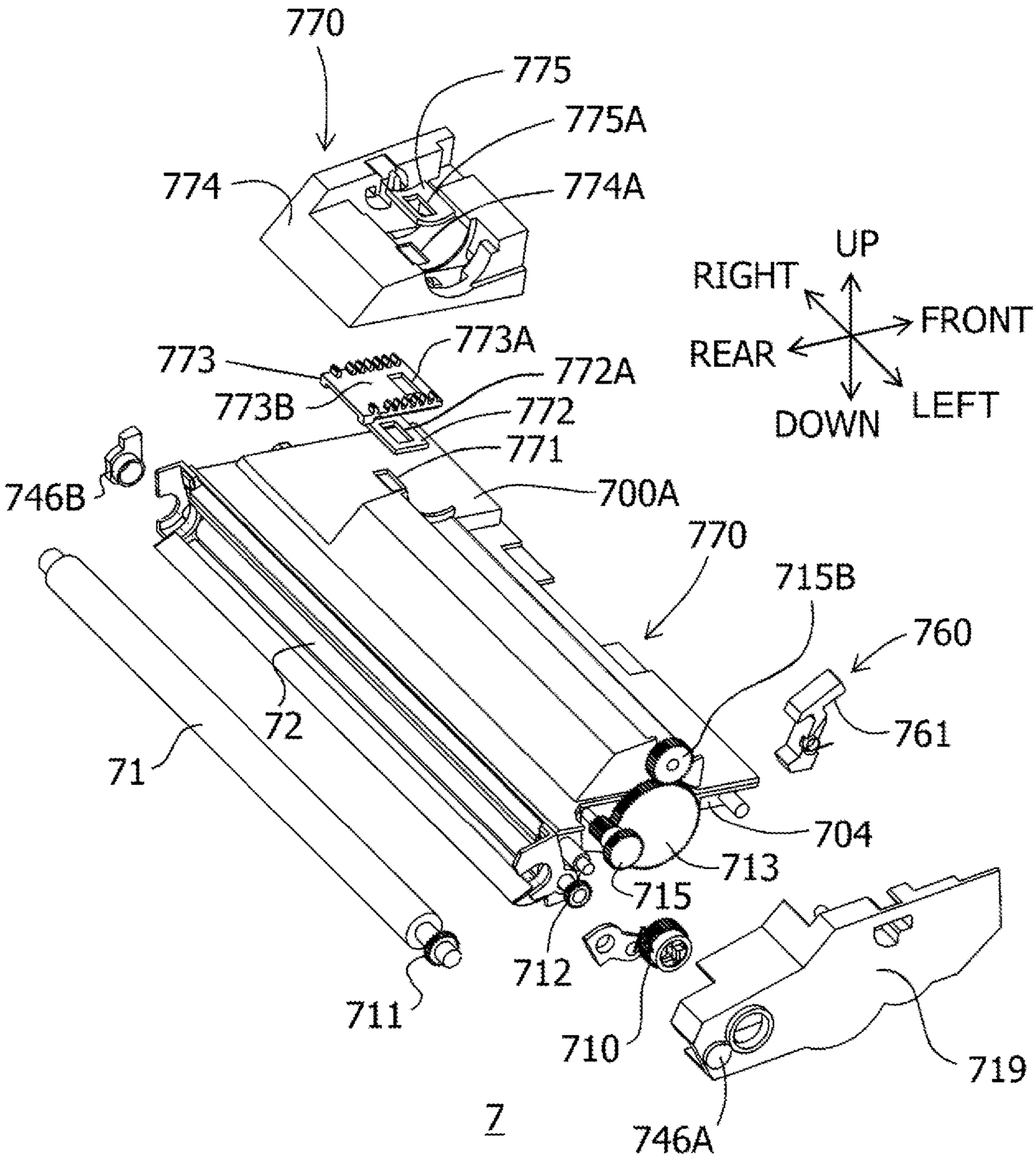
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FIG.5

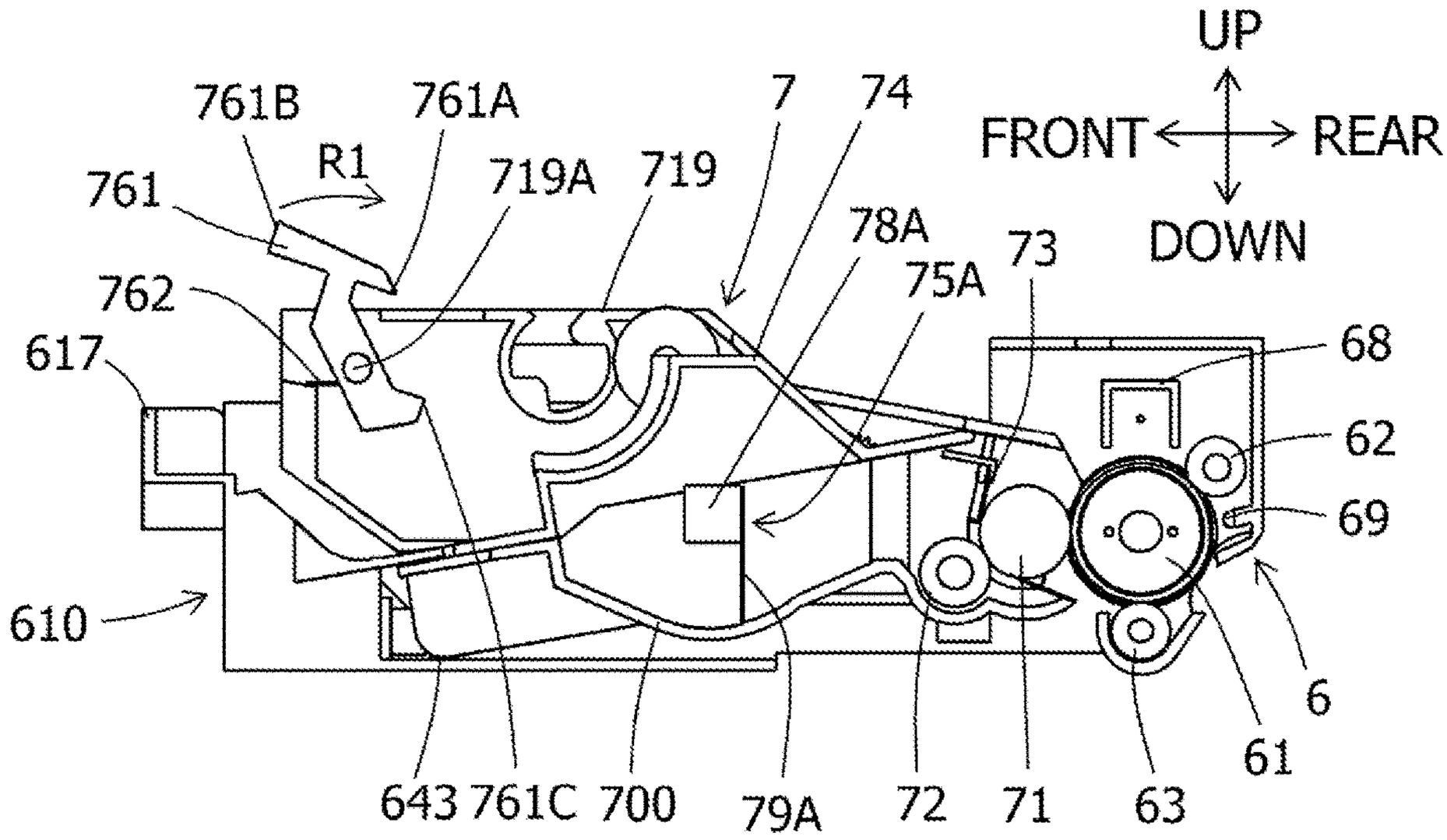
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FIG.6

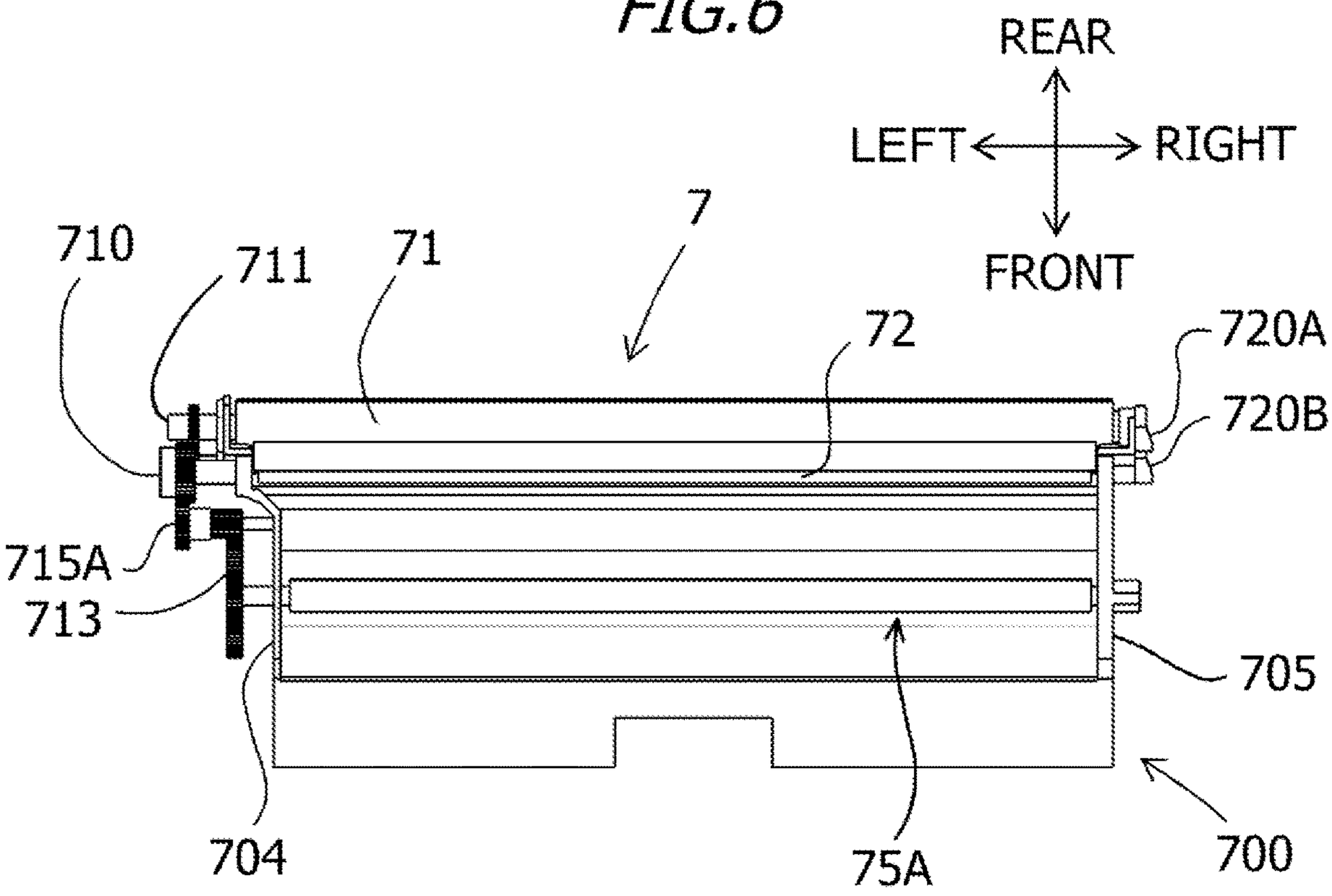
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FIG.7

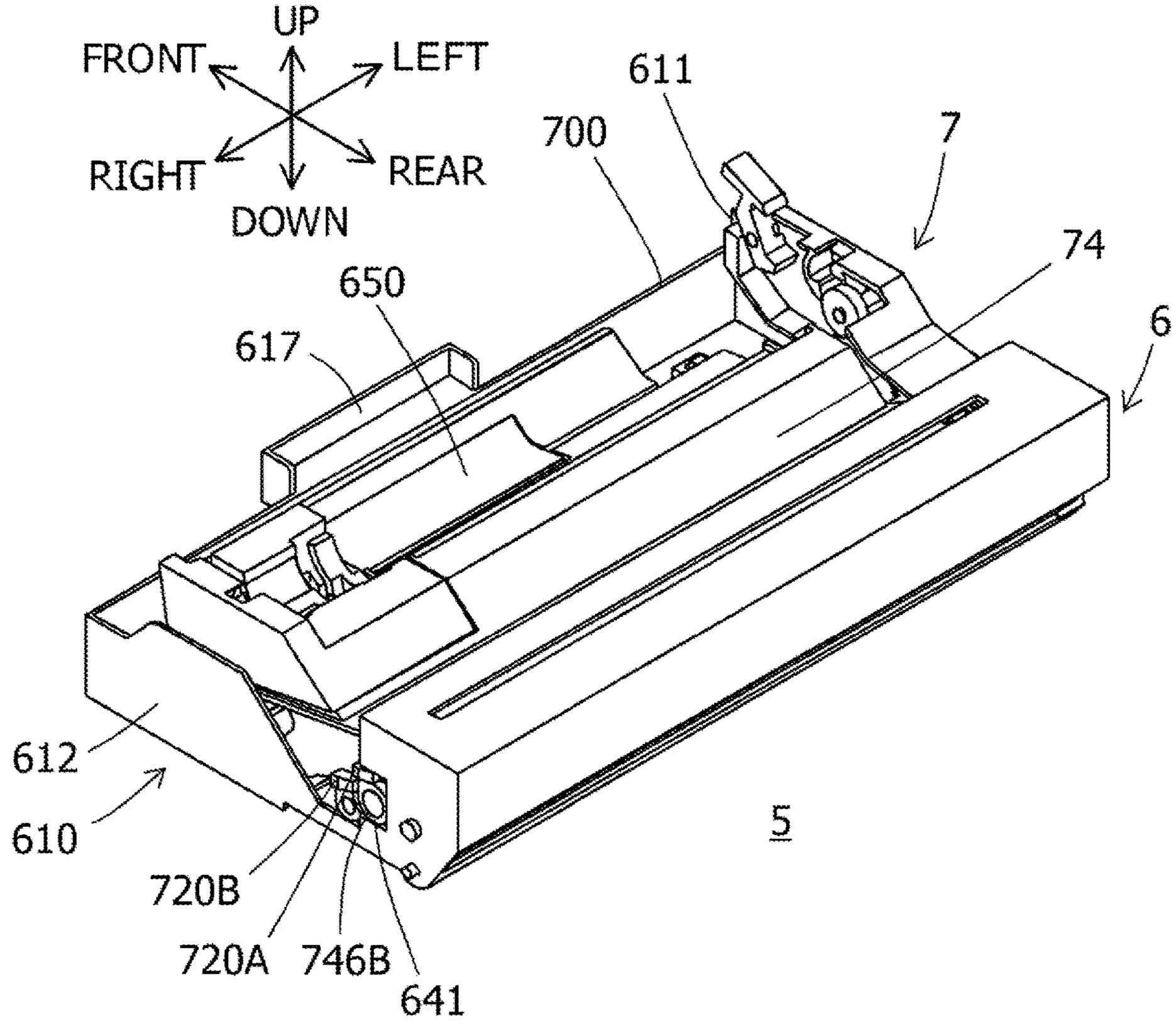
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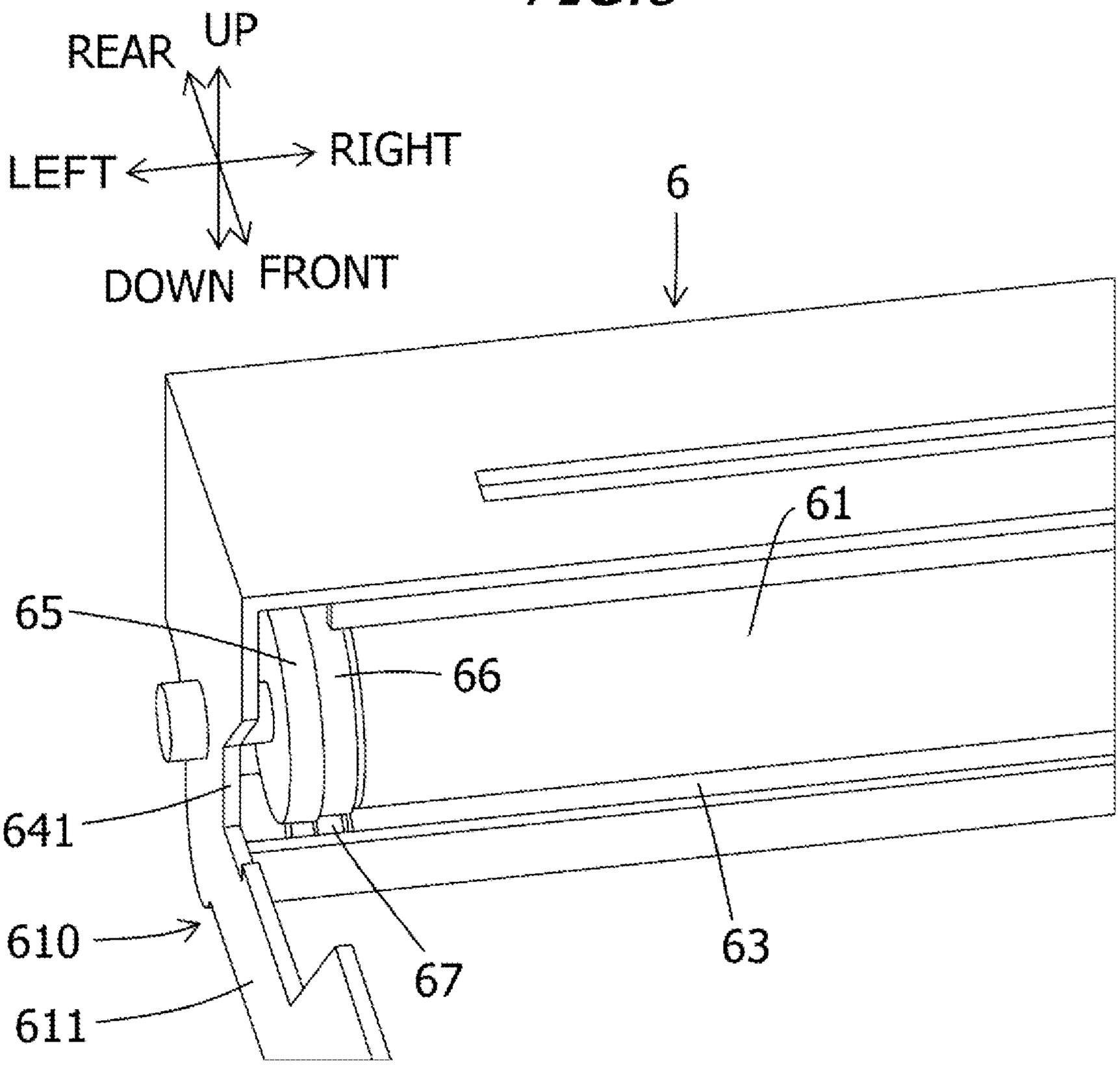
FIG.8



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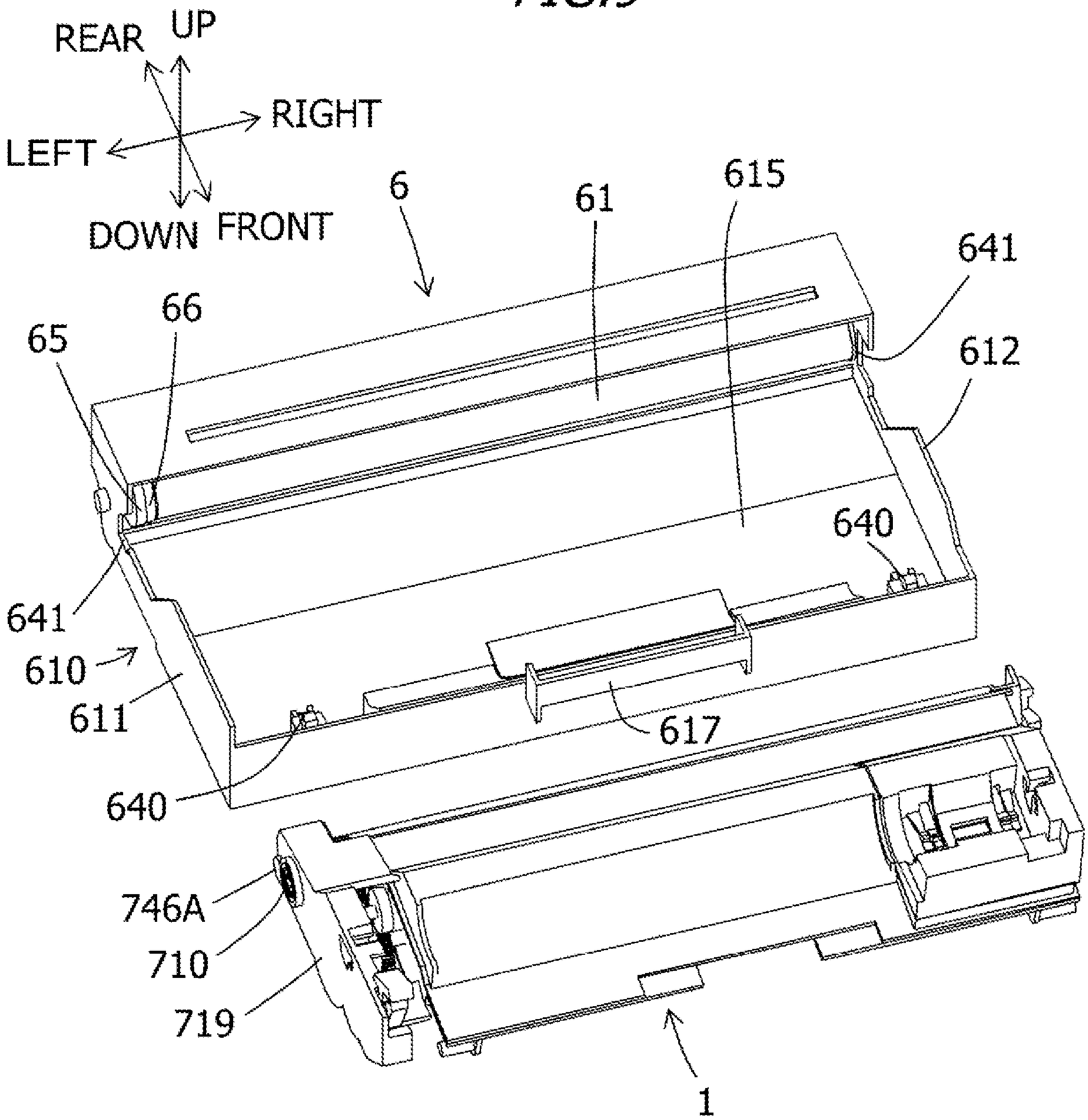
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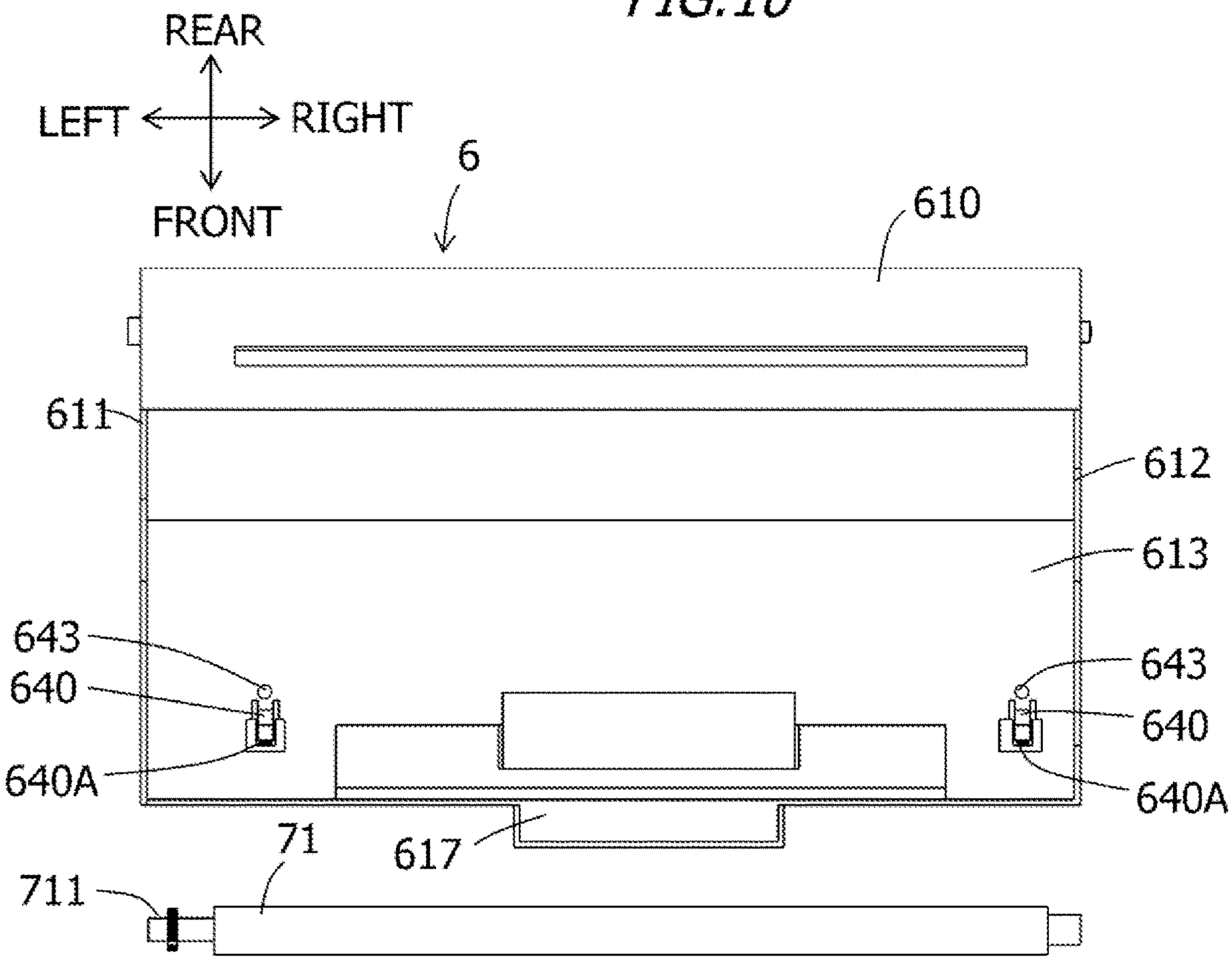
FIG.10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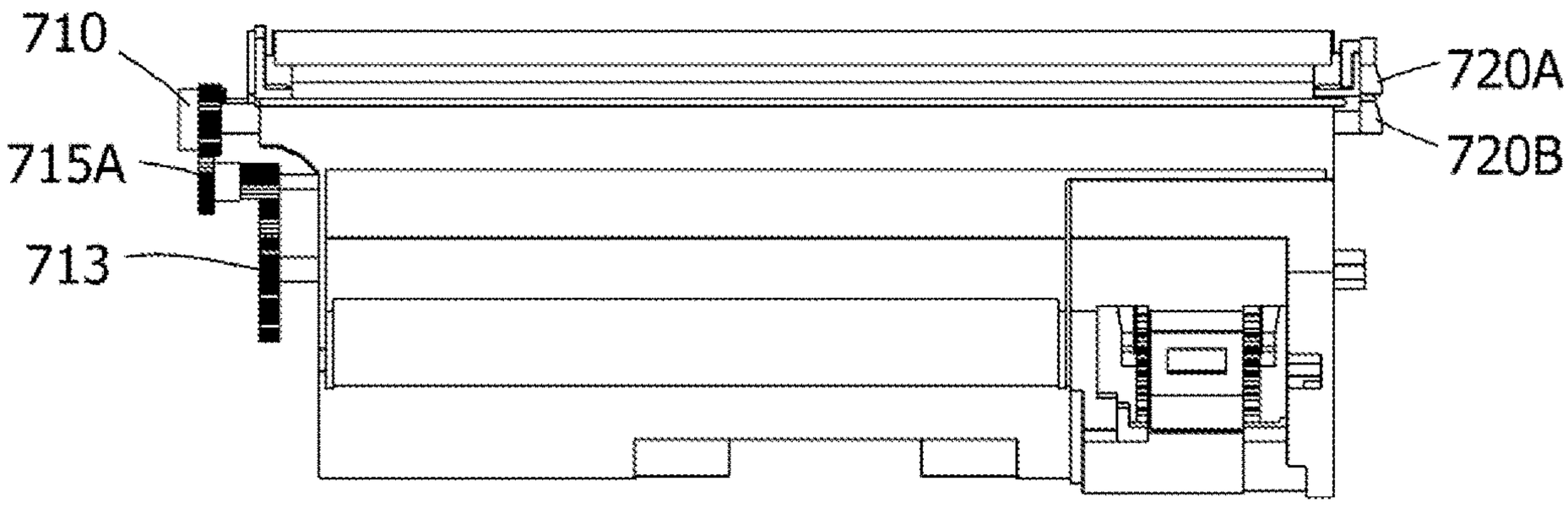
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FIG.11

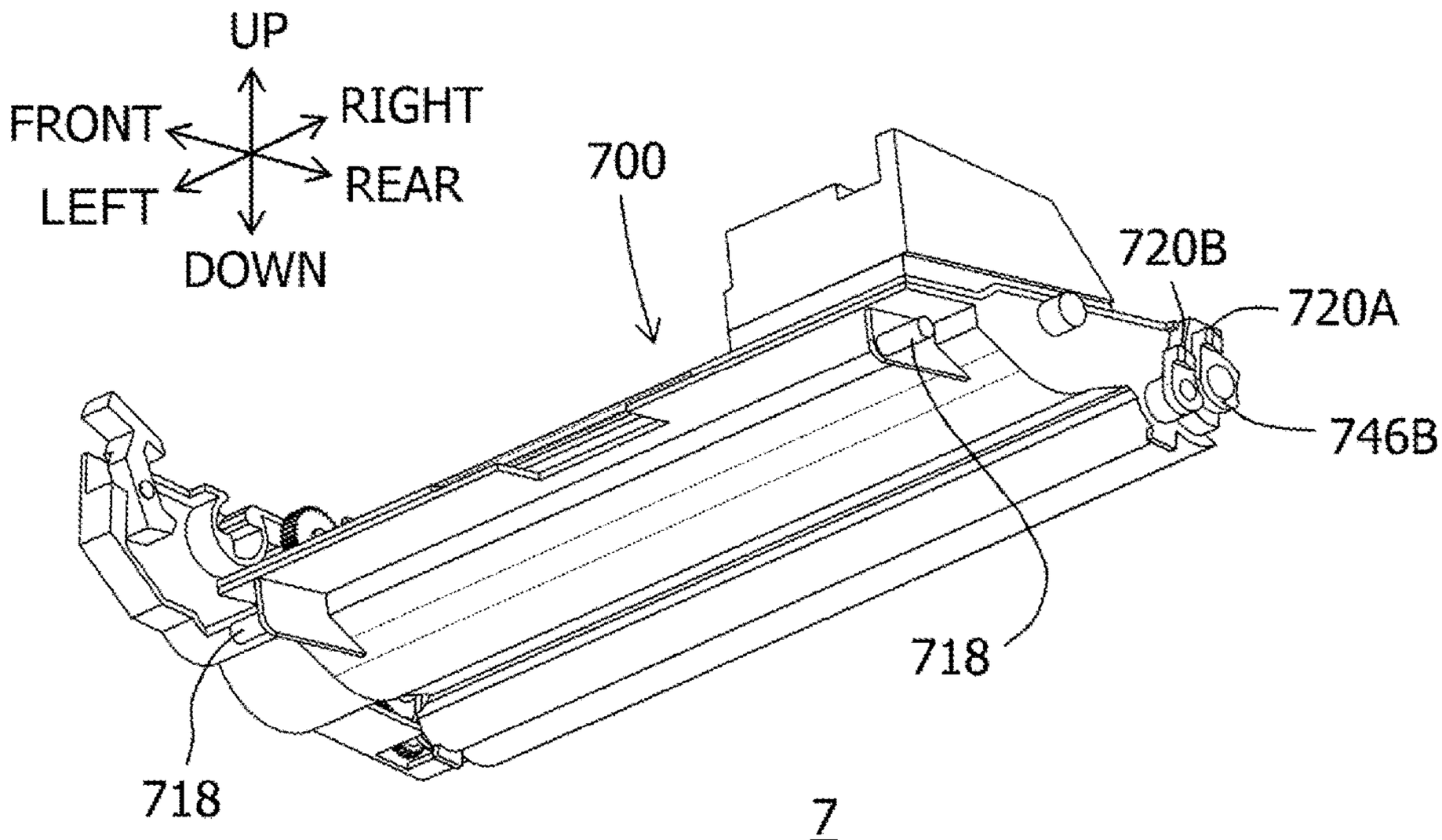

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FIG.12

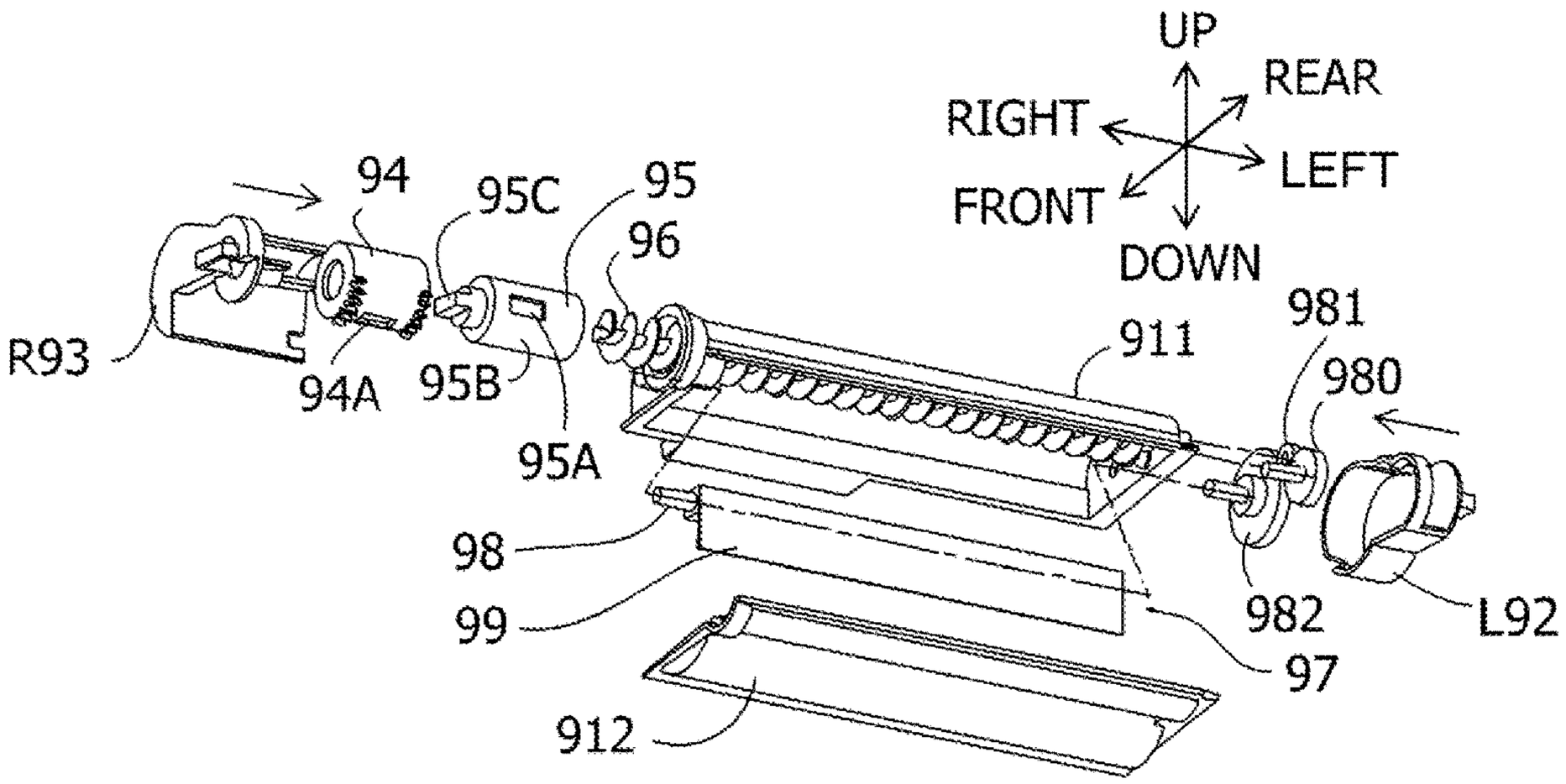

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FIG. 13

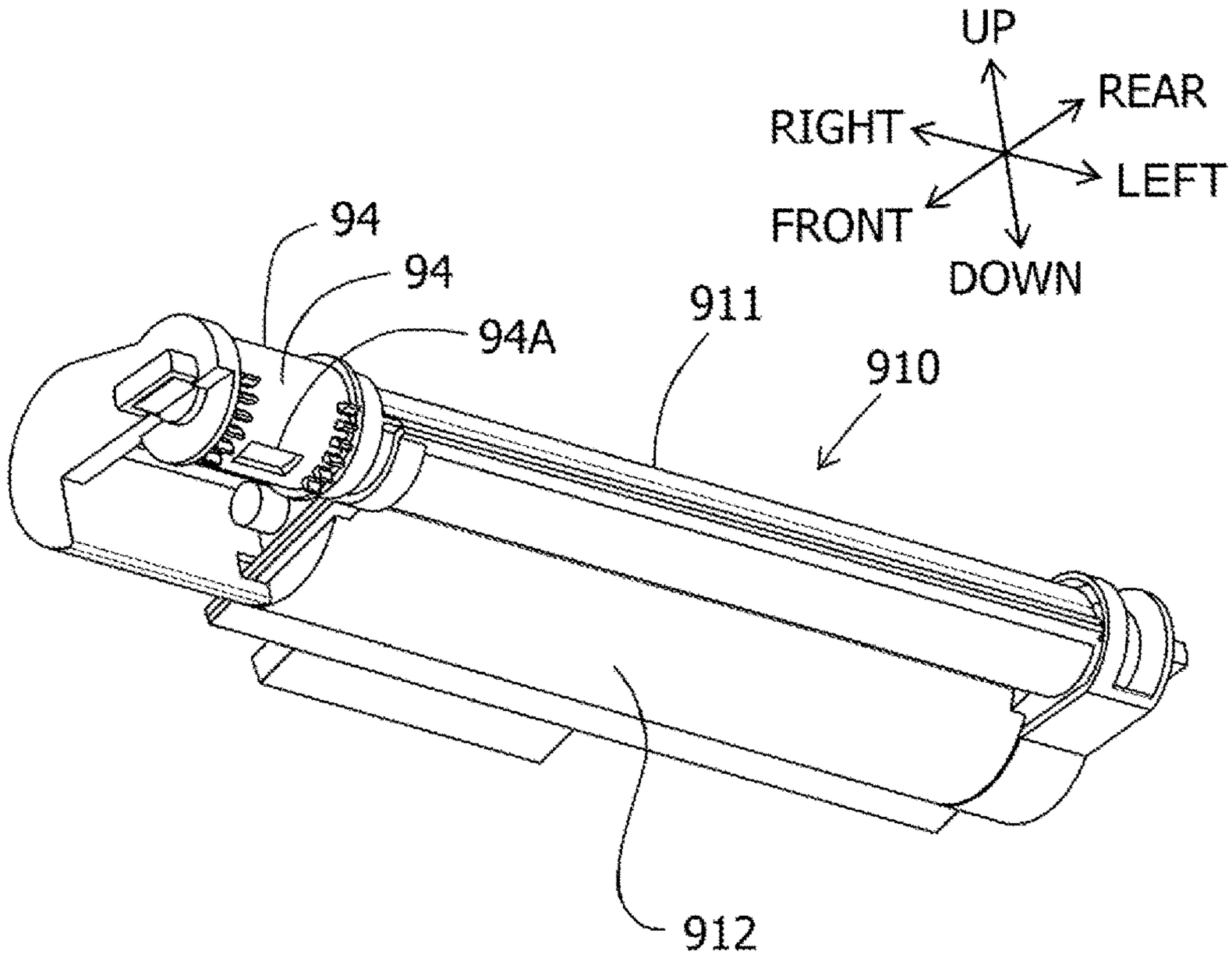

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FIG. 14

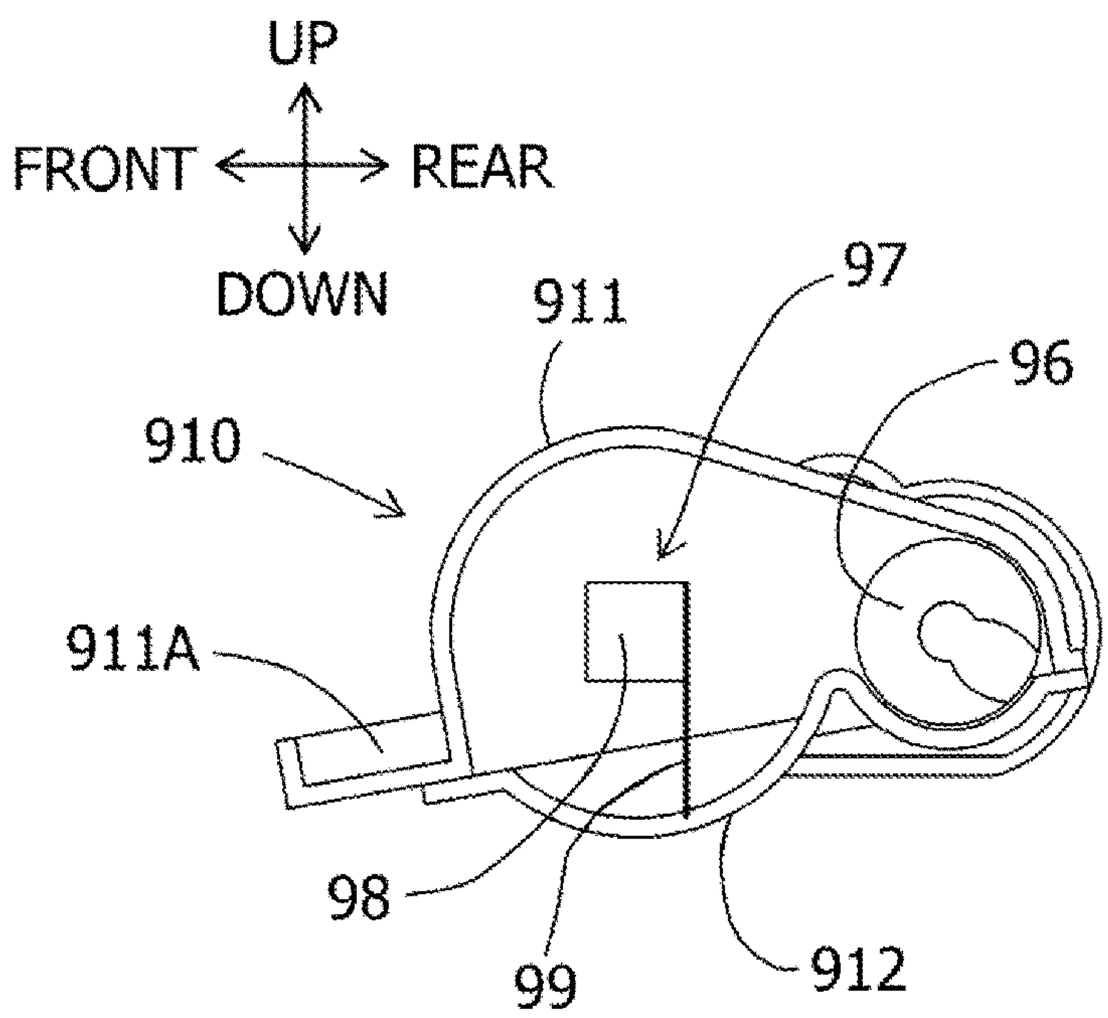

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FIG. 15A

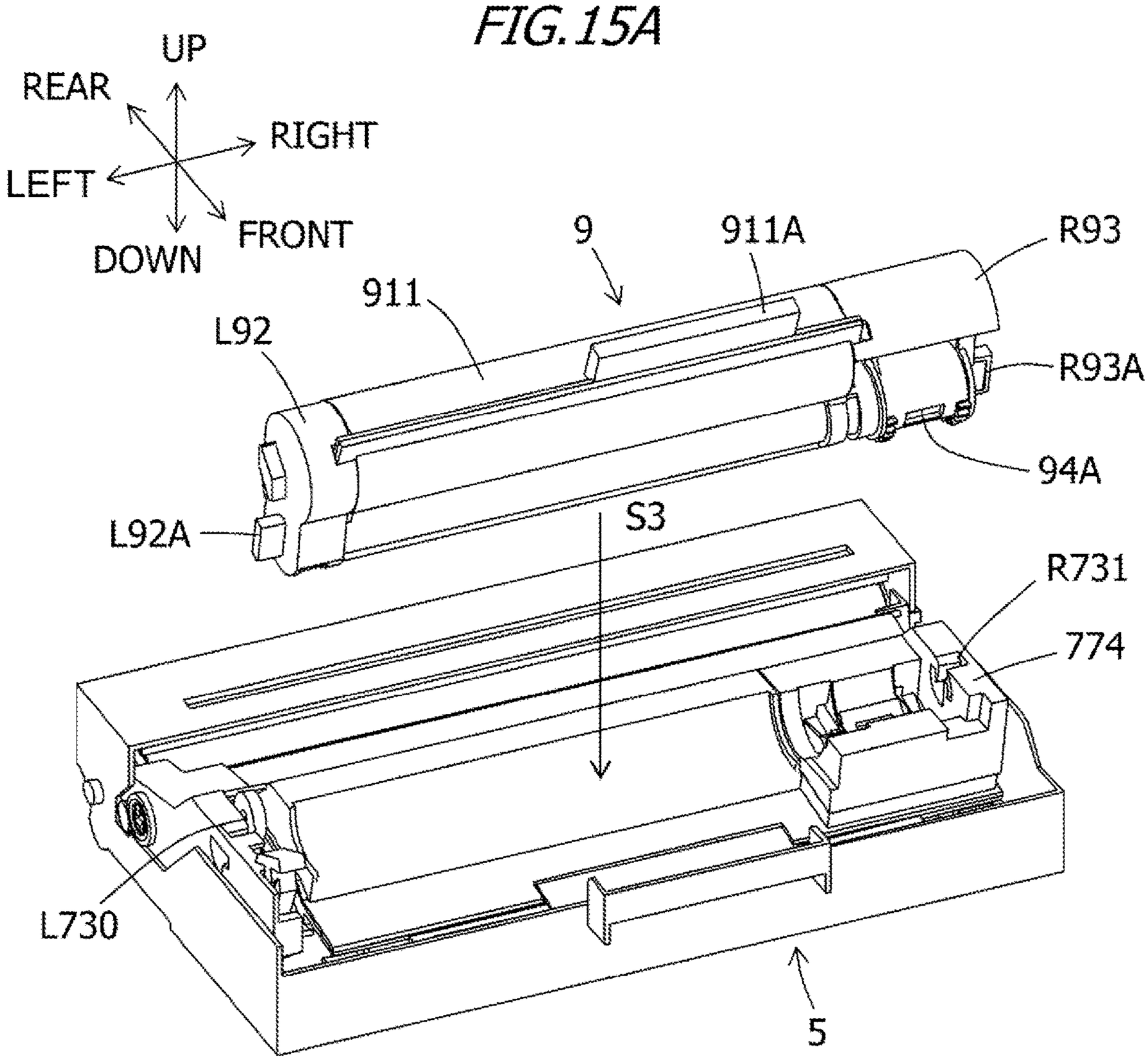
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FIG. 15B

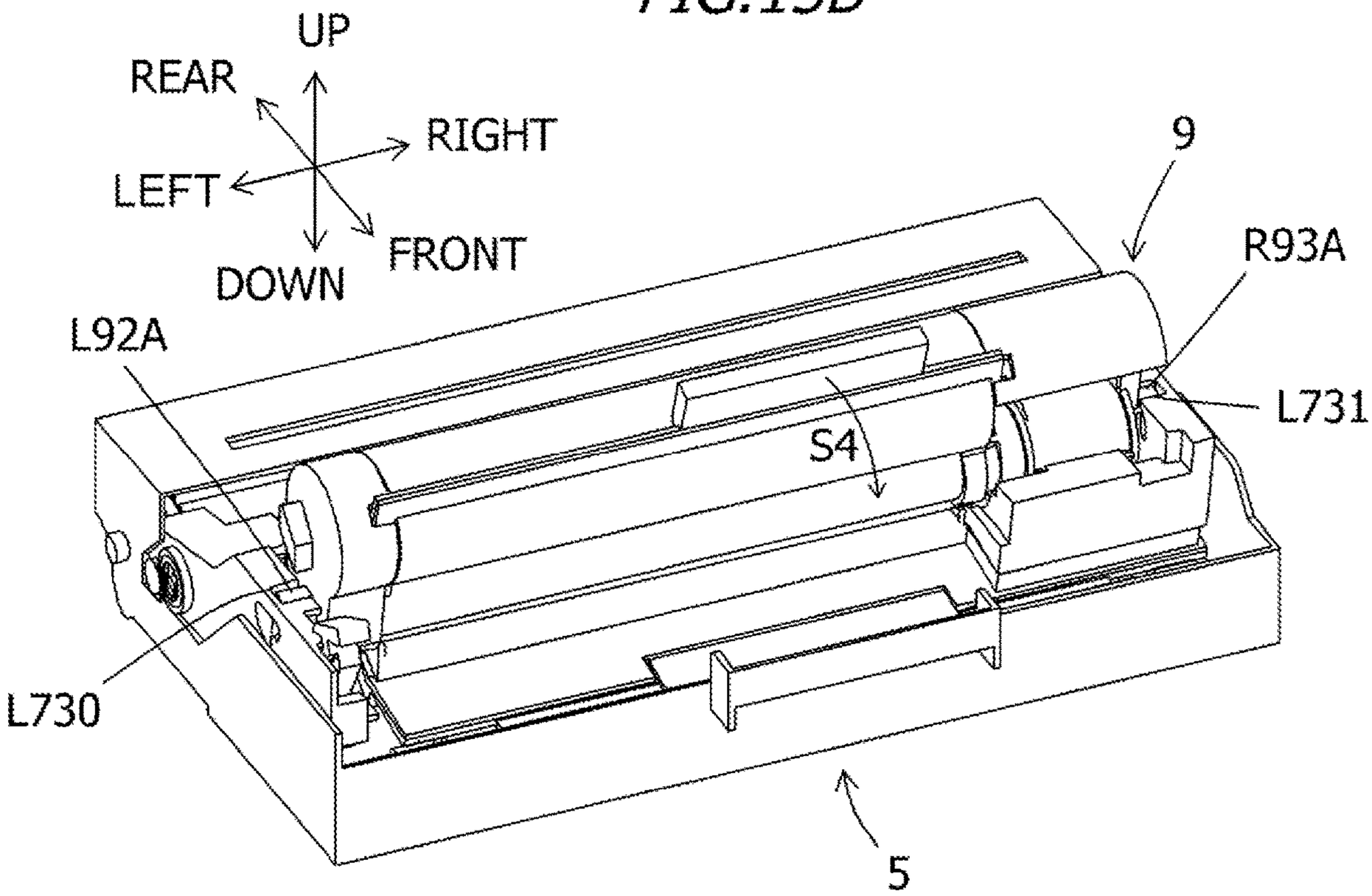


FIG. 15C

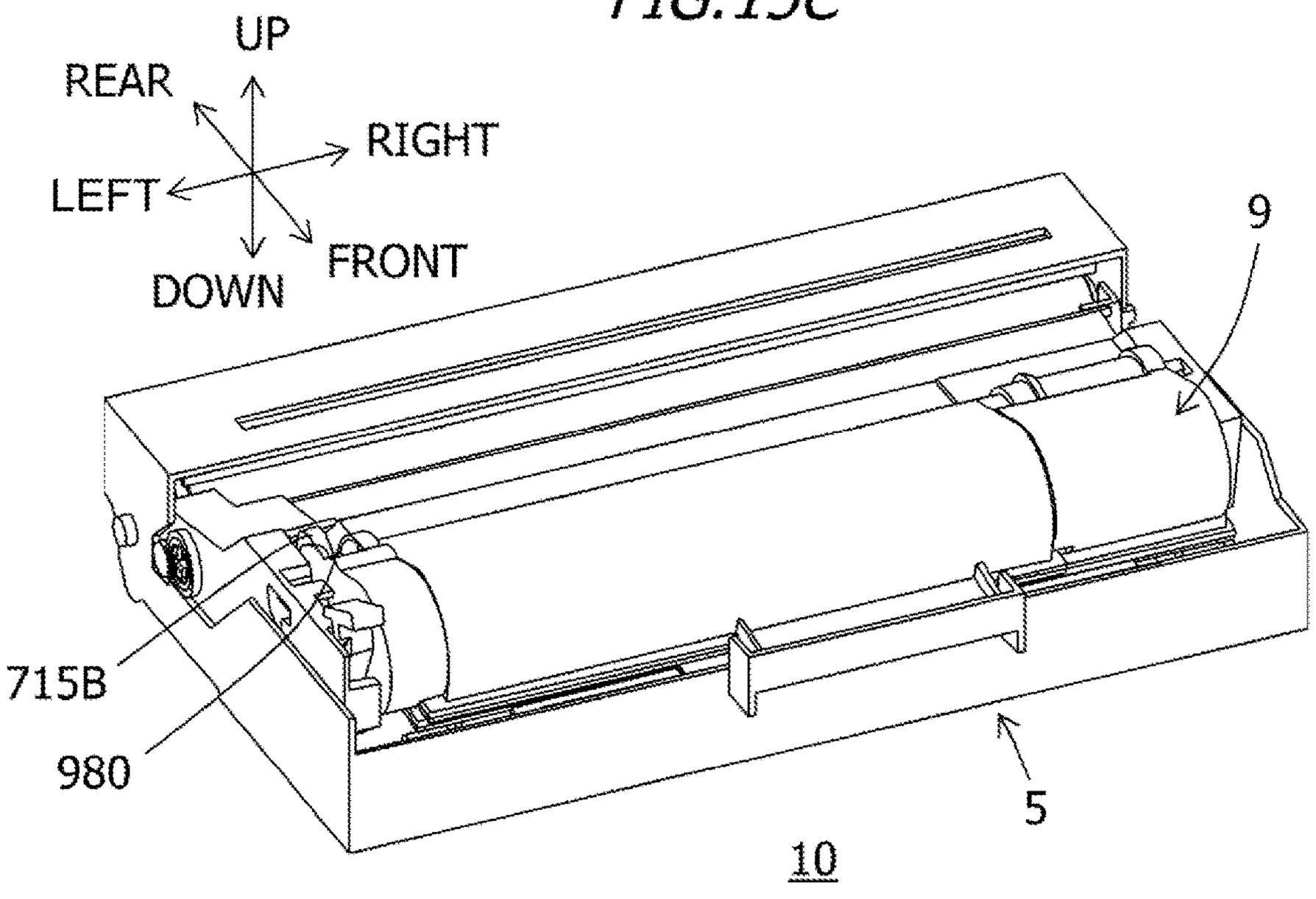


FIG. 16A

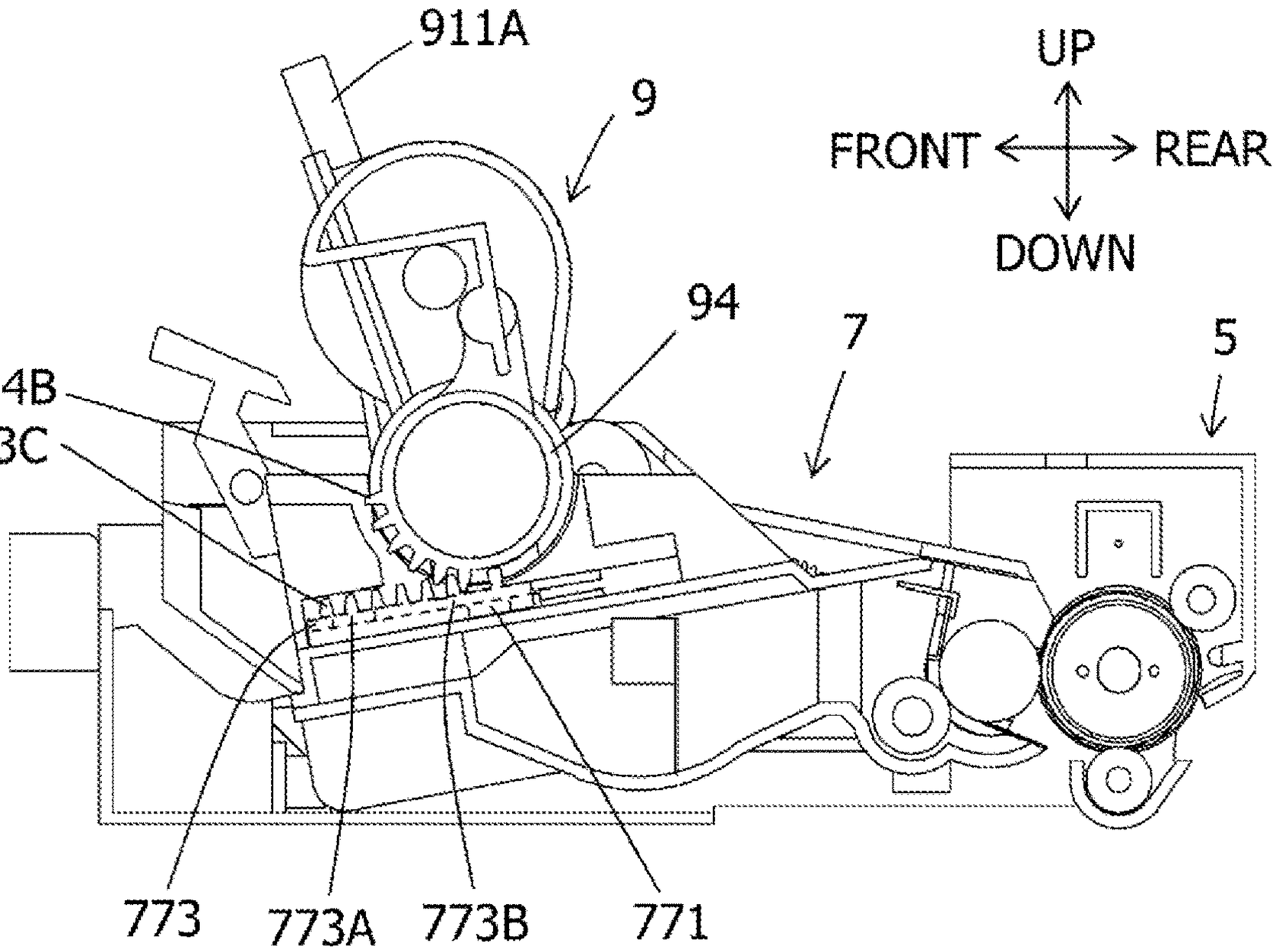


FIG. 16B

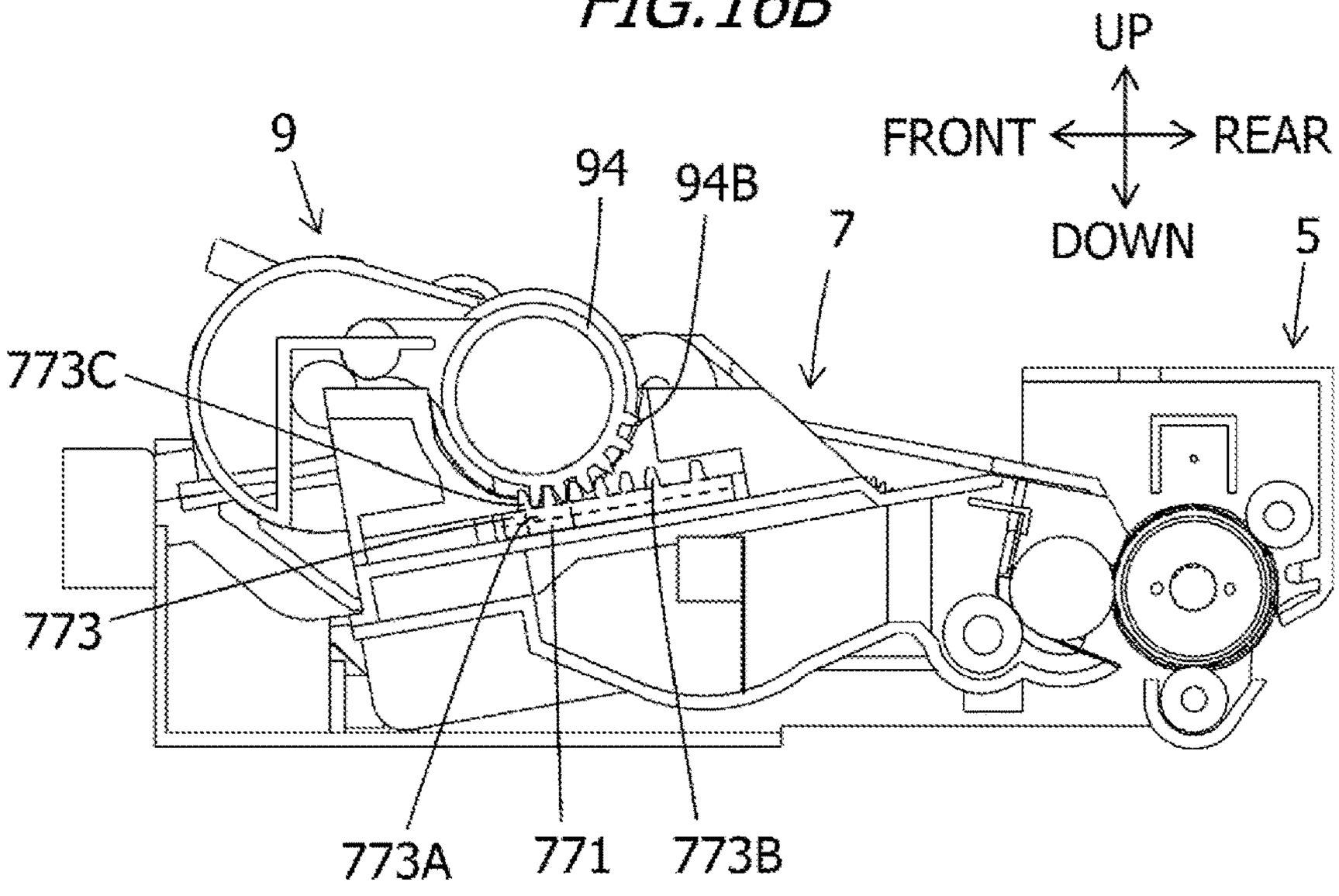


FIG.17A

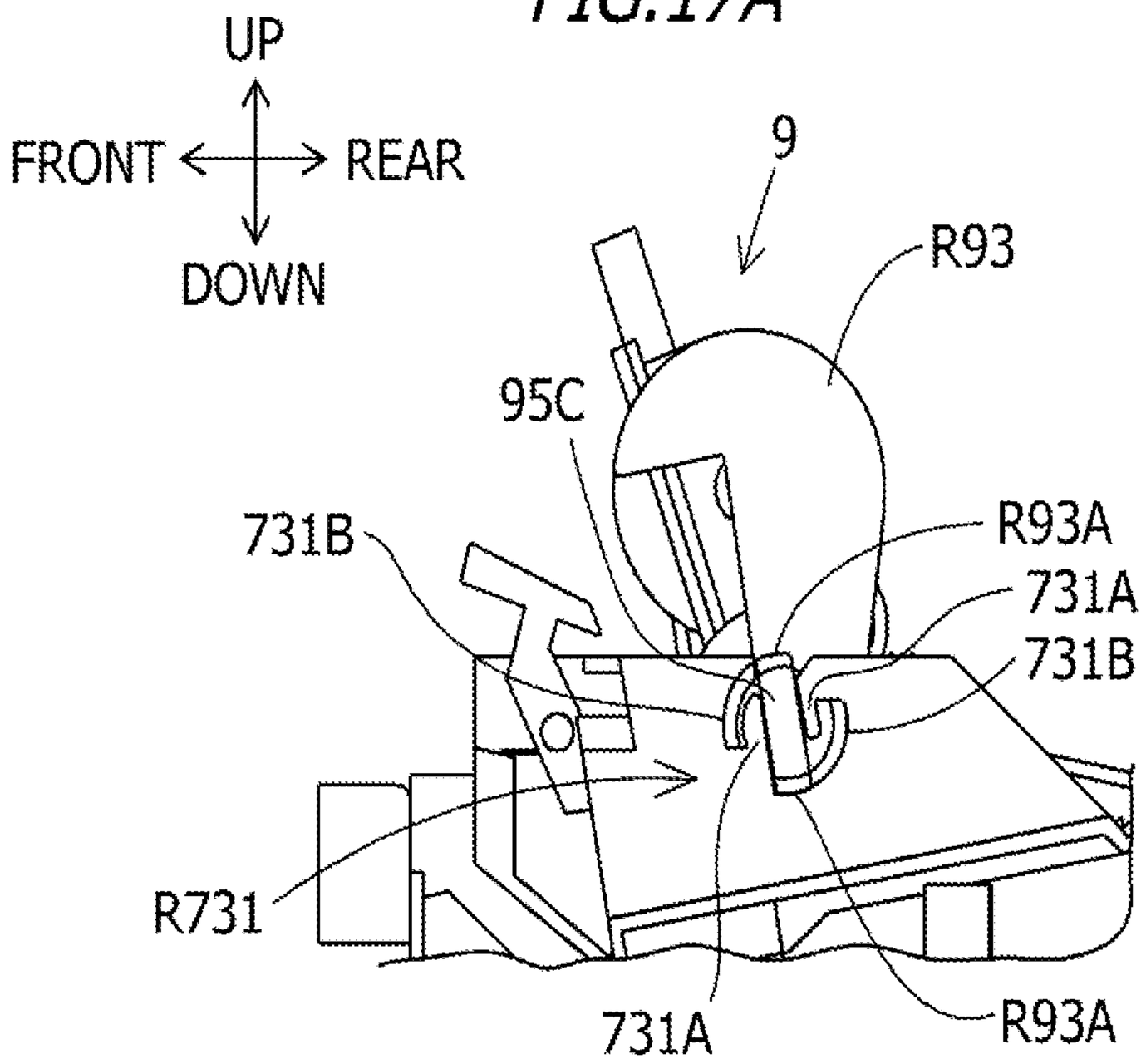


FIG.17B

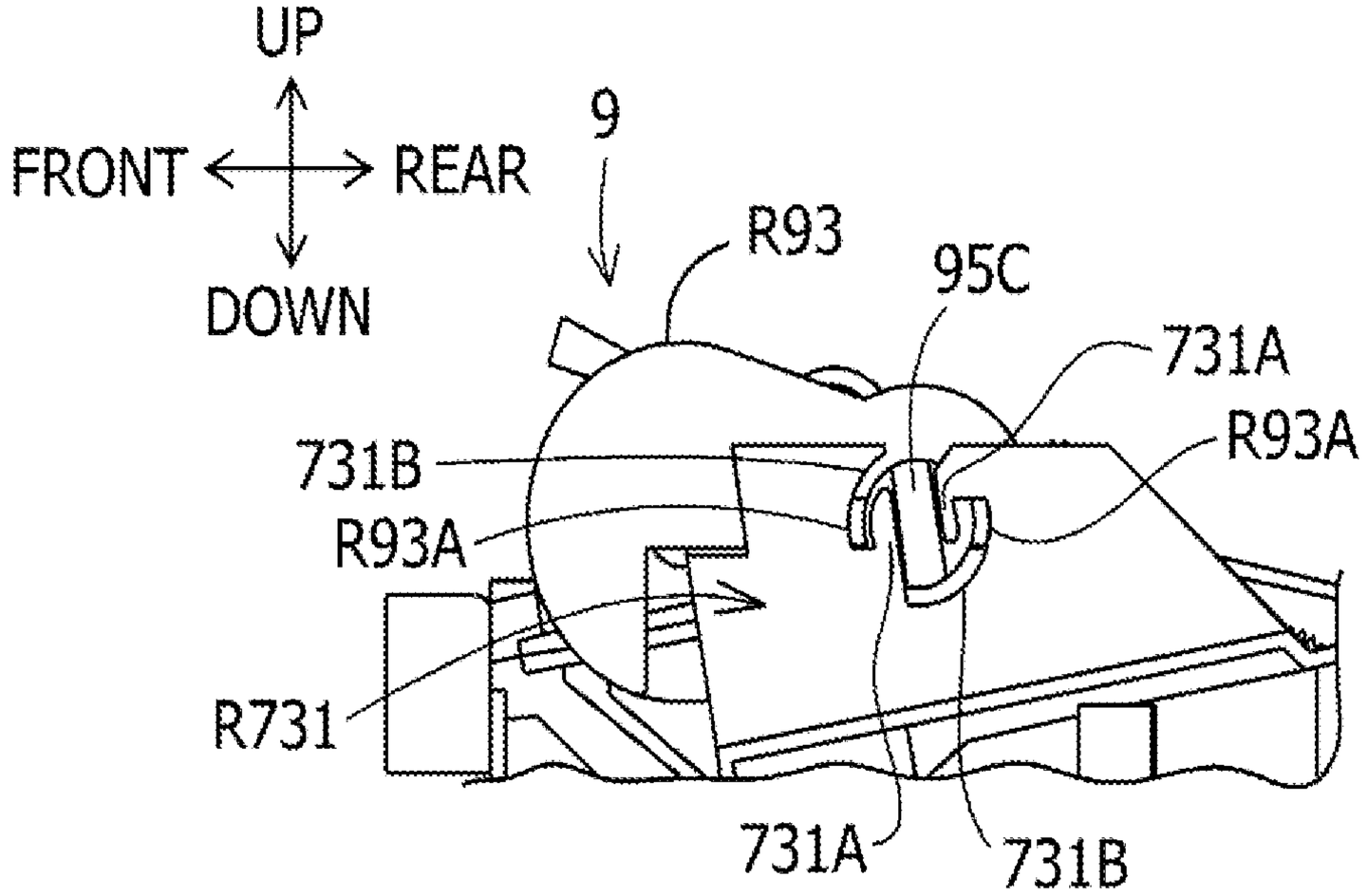


FIG. 18A

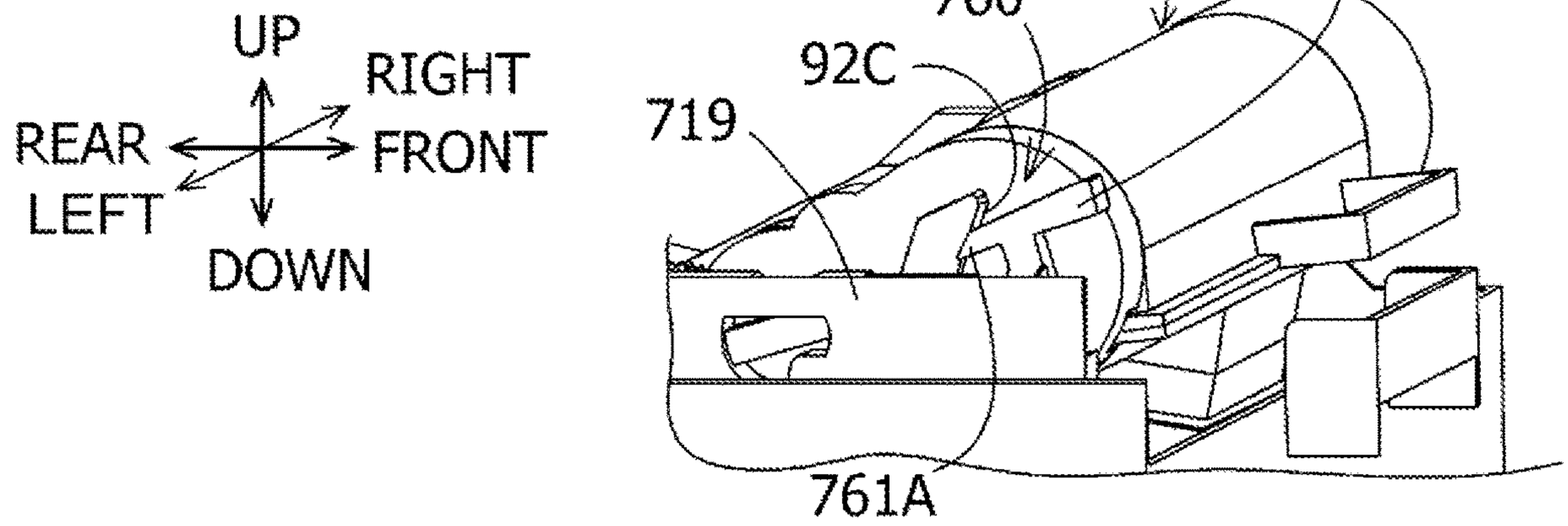


FIG. 18B

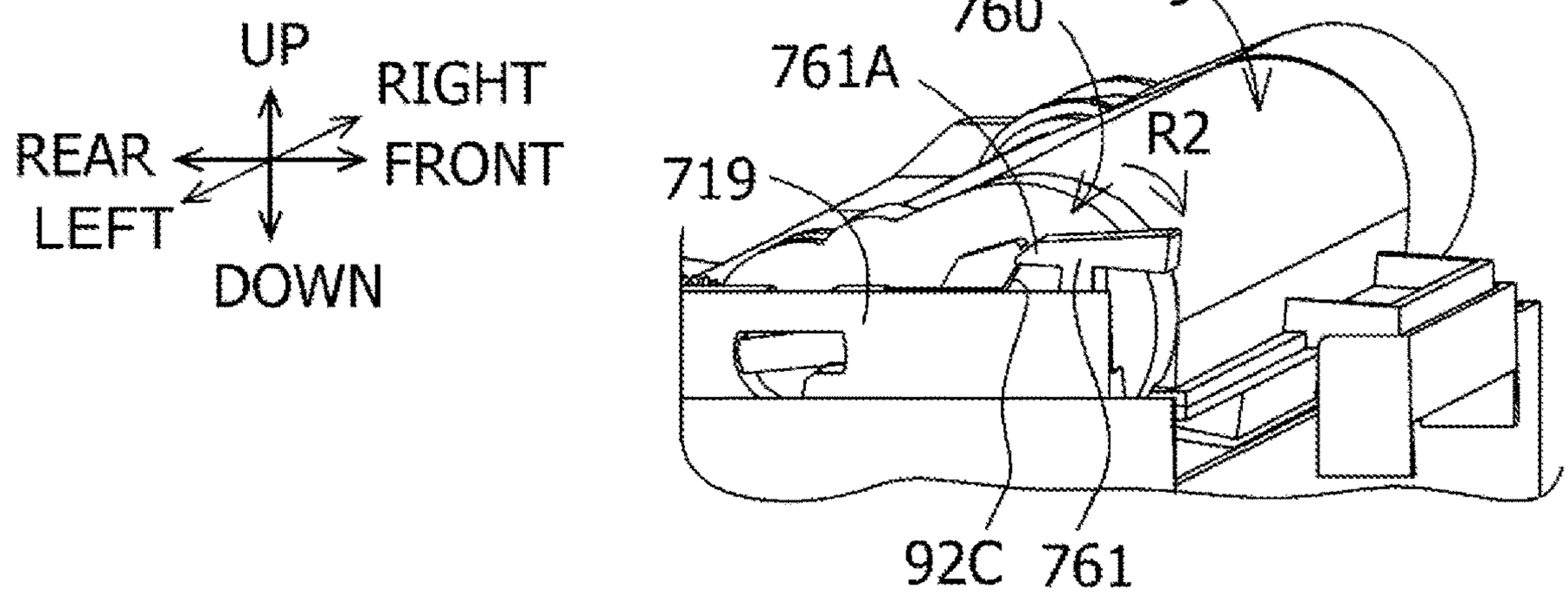


FIG. 18C

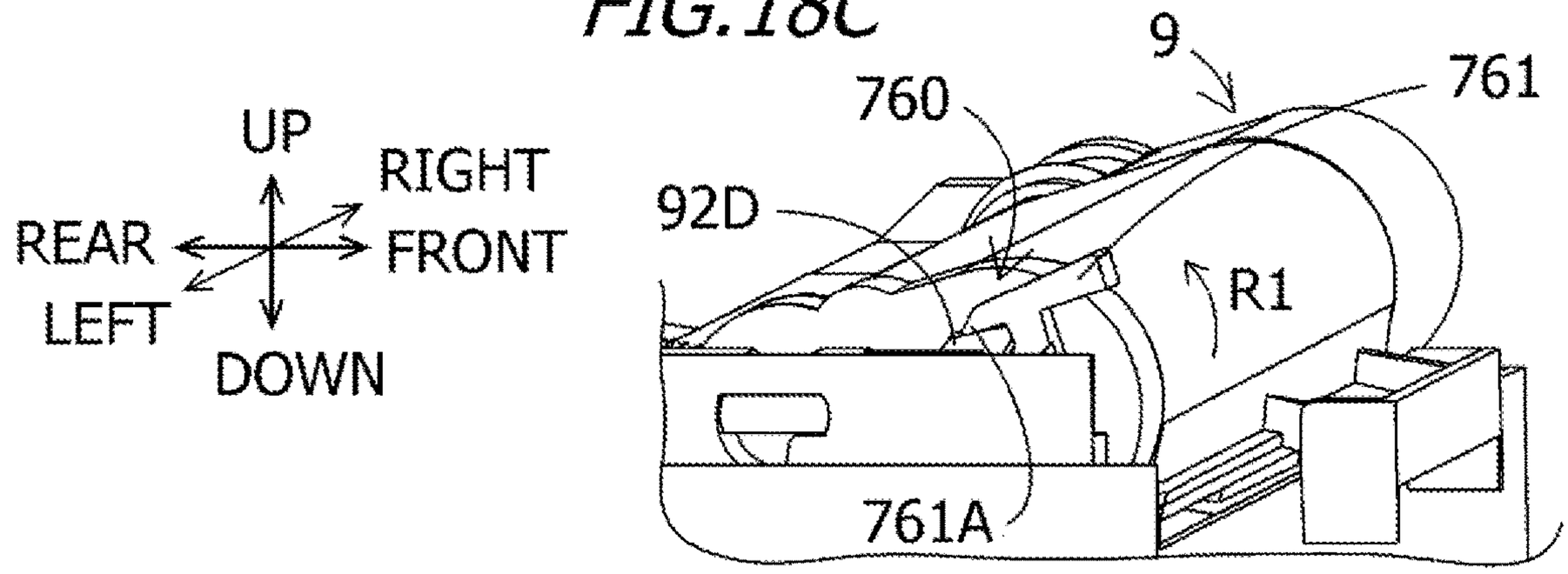


FIG.19A

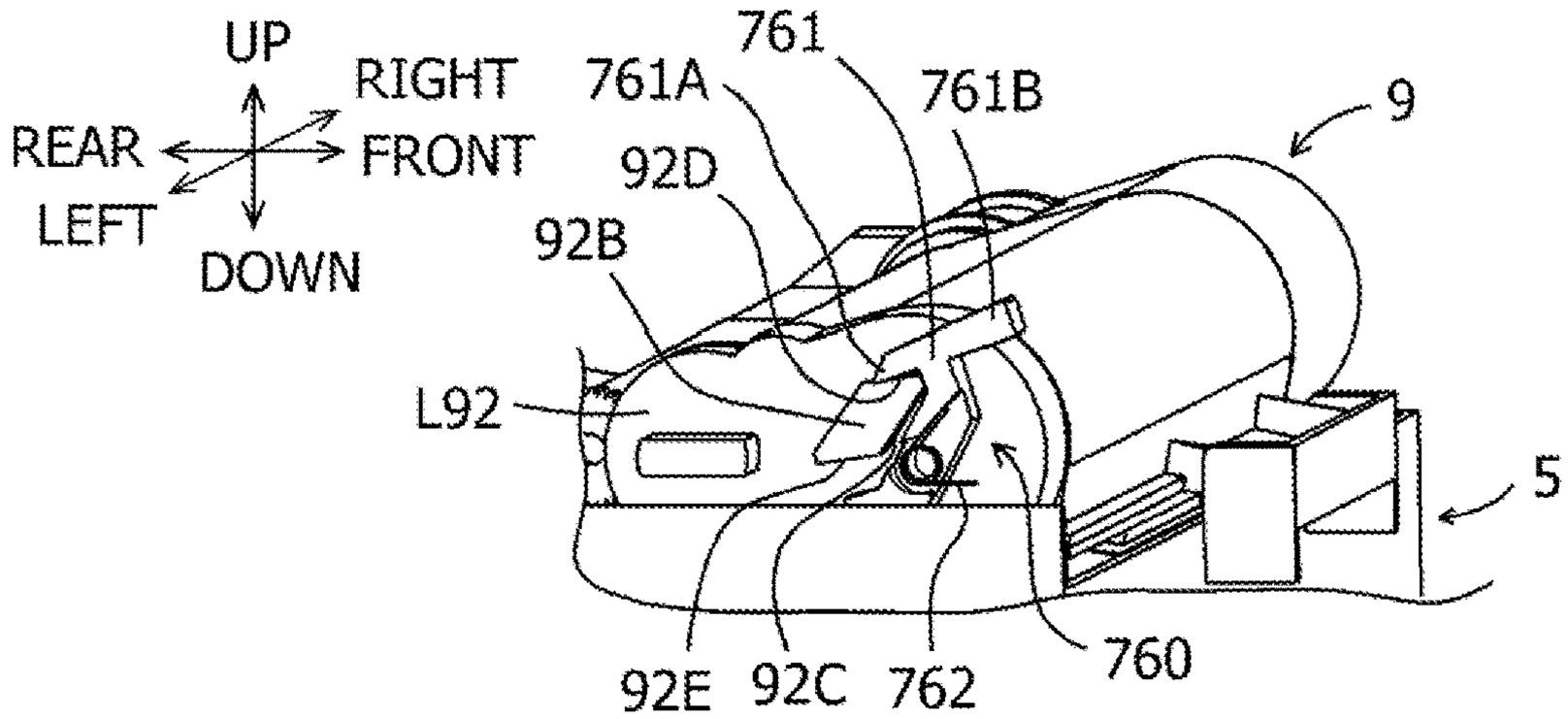


FIG.19B

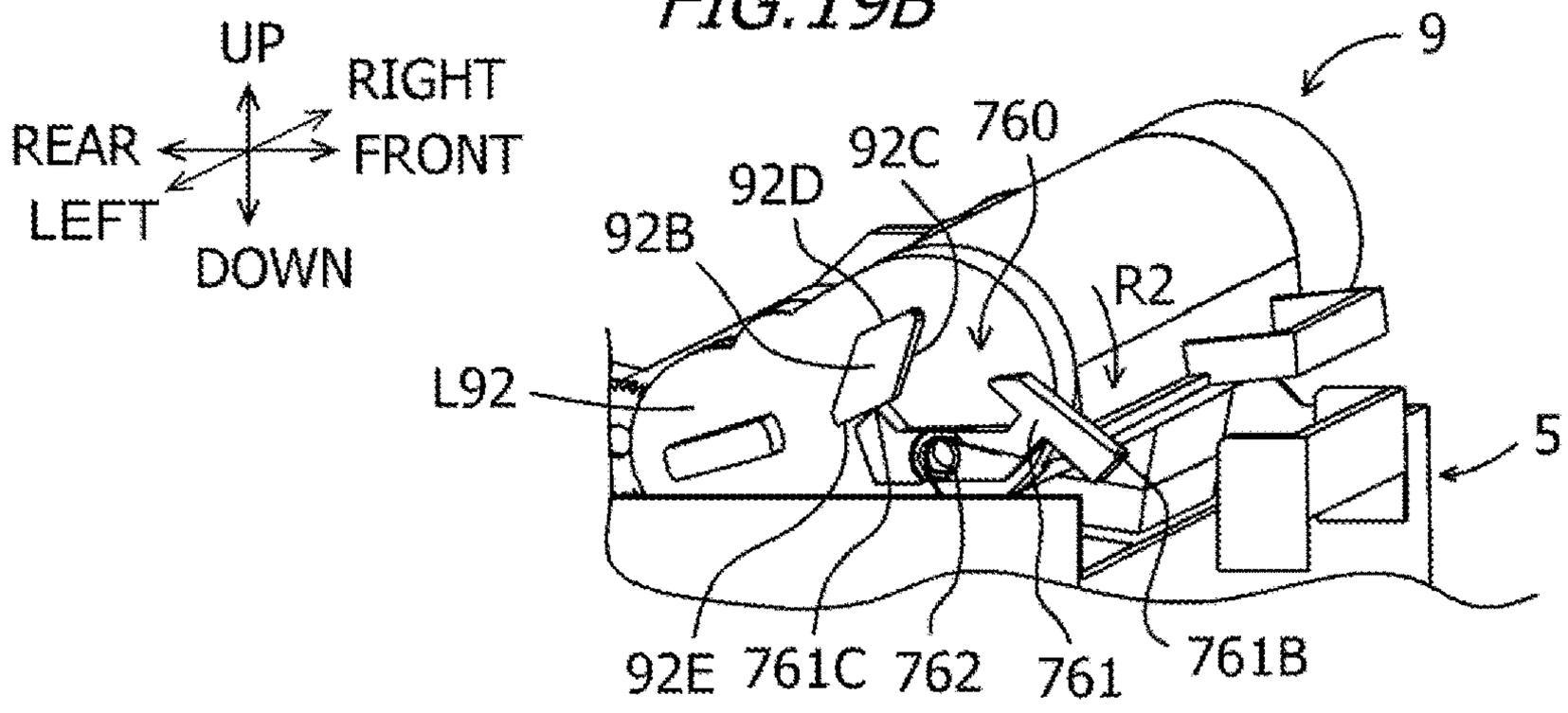
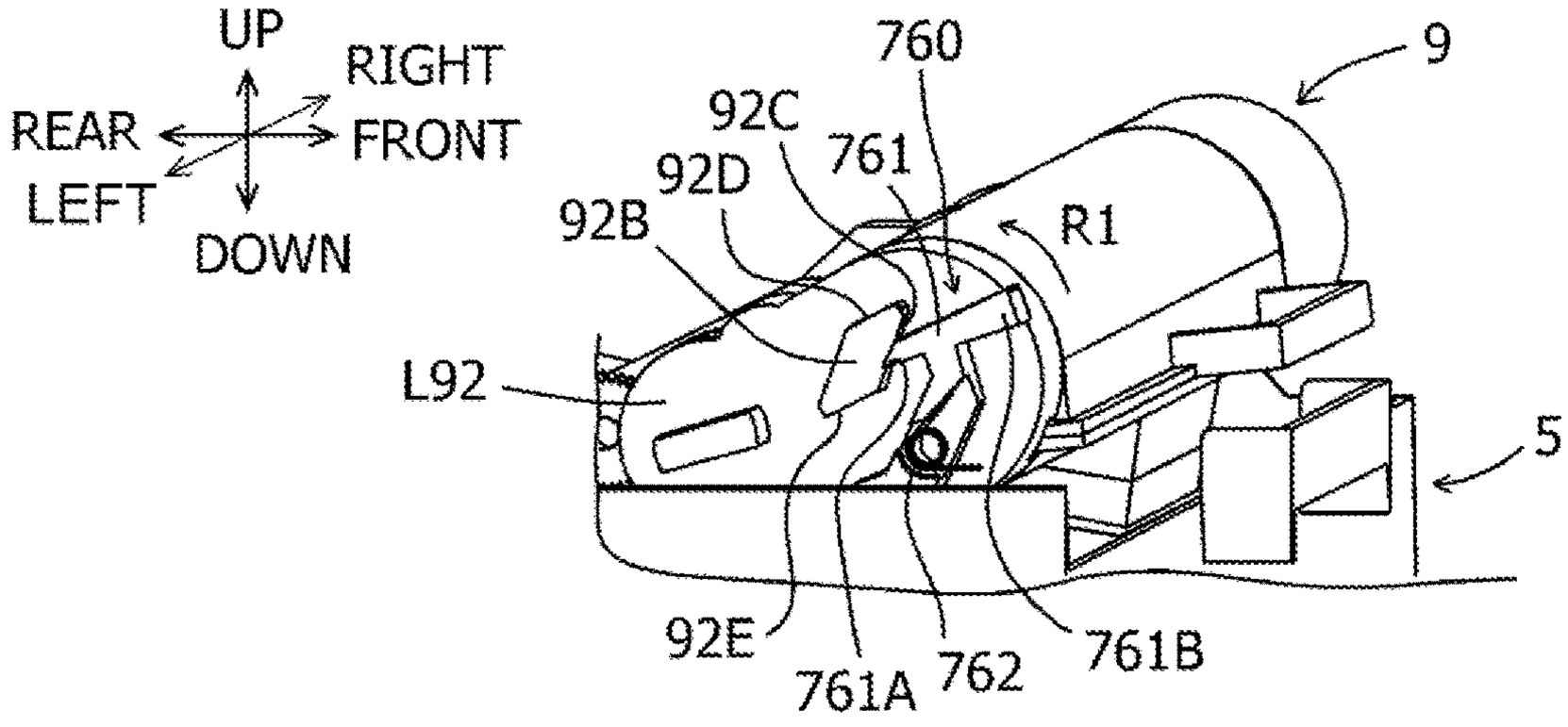


FIG.19C



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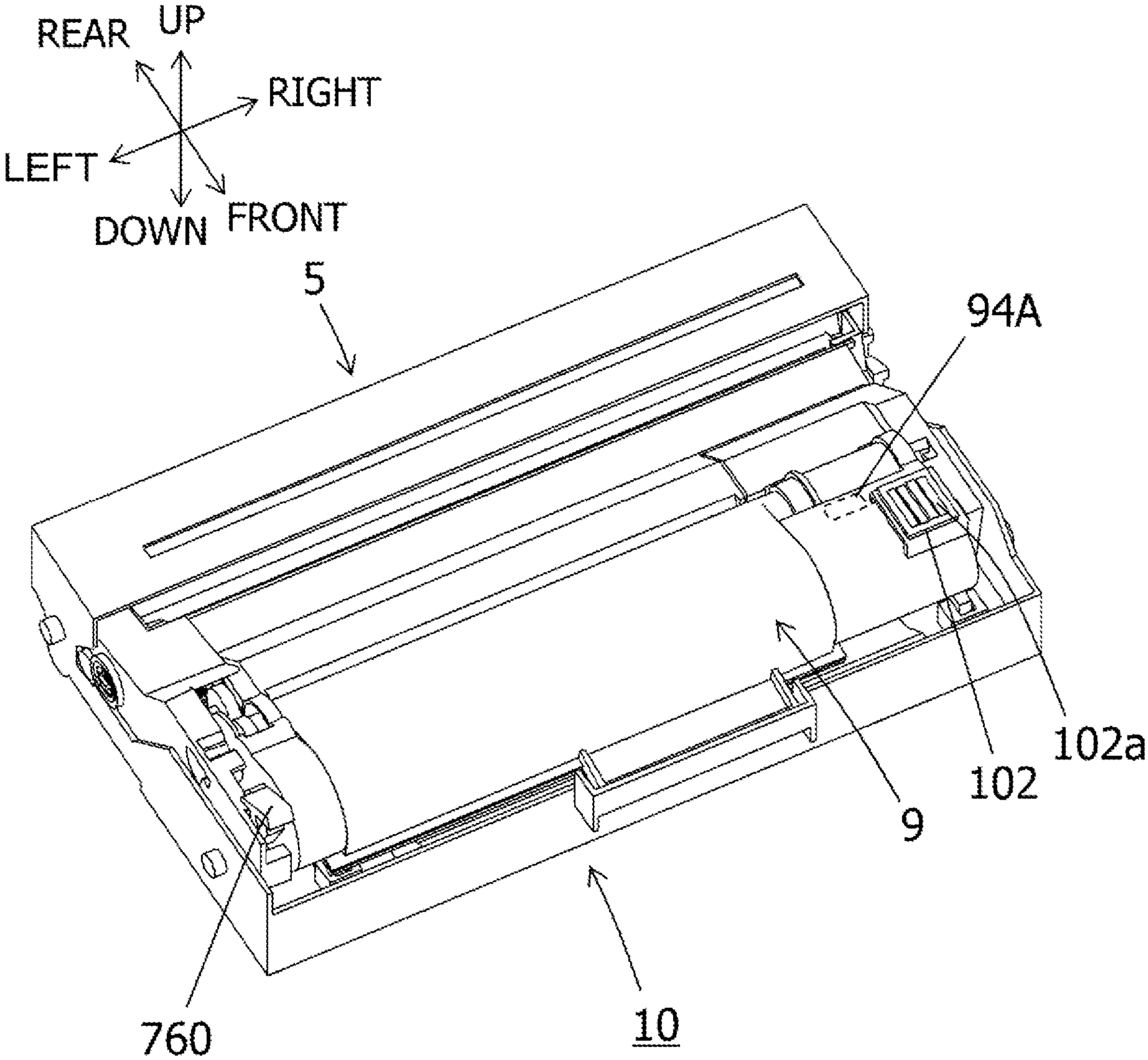

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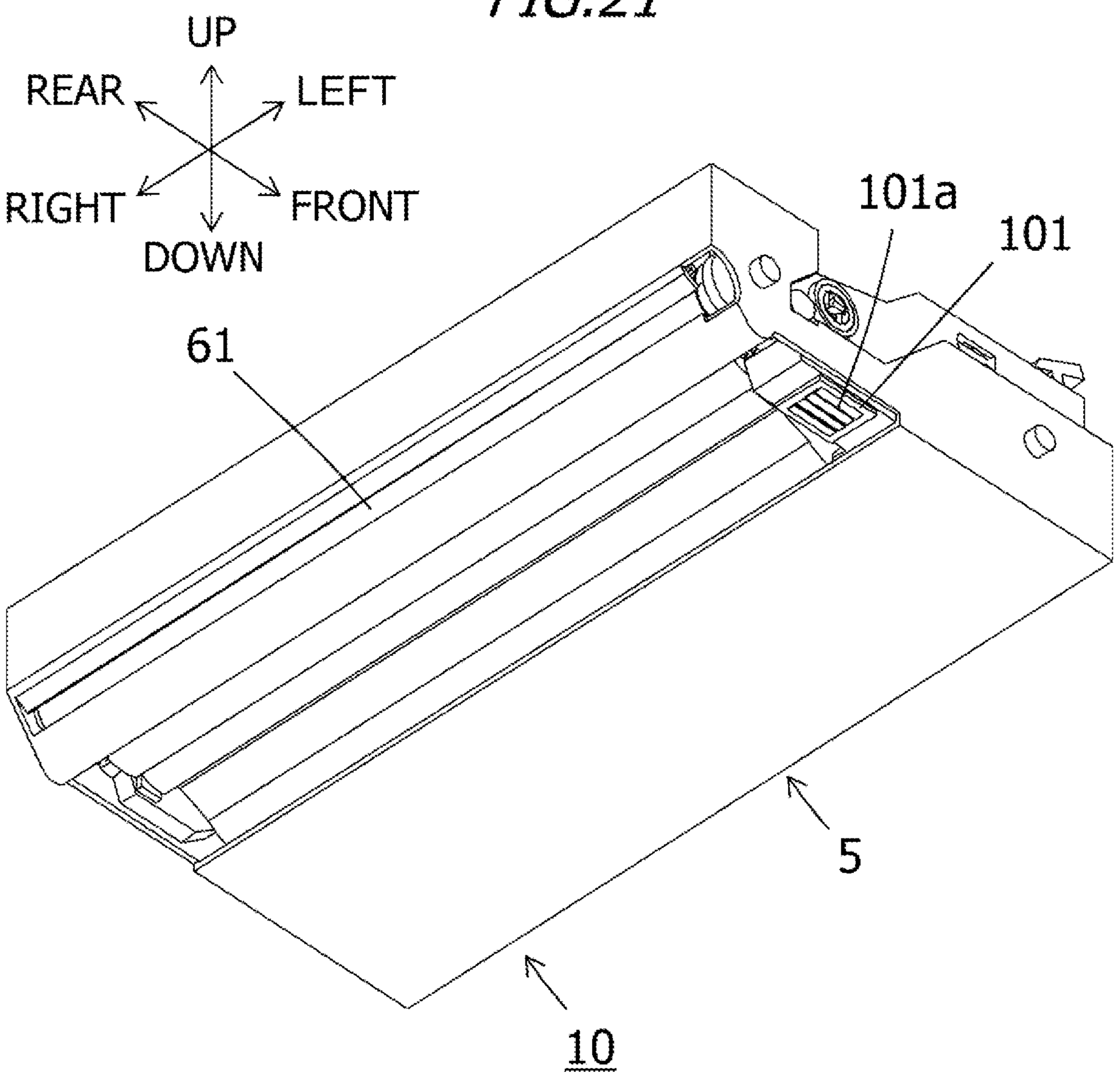

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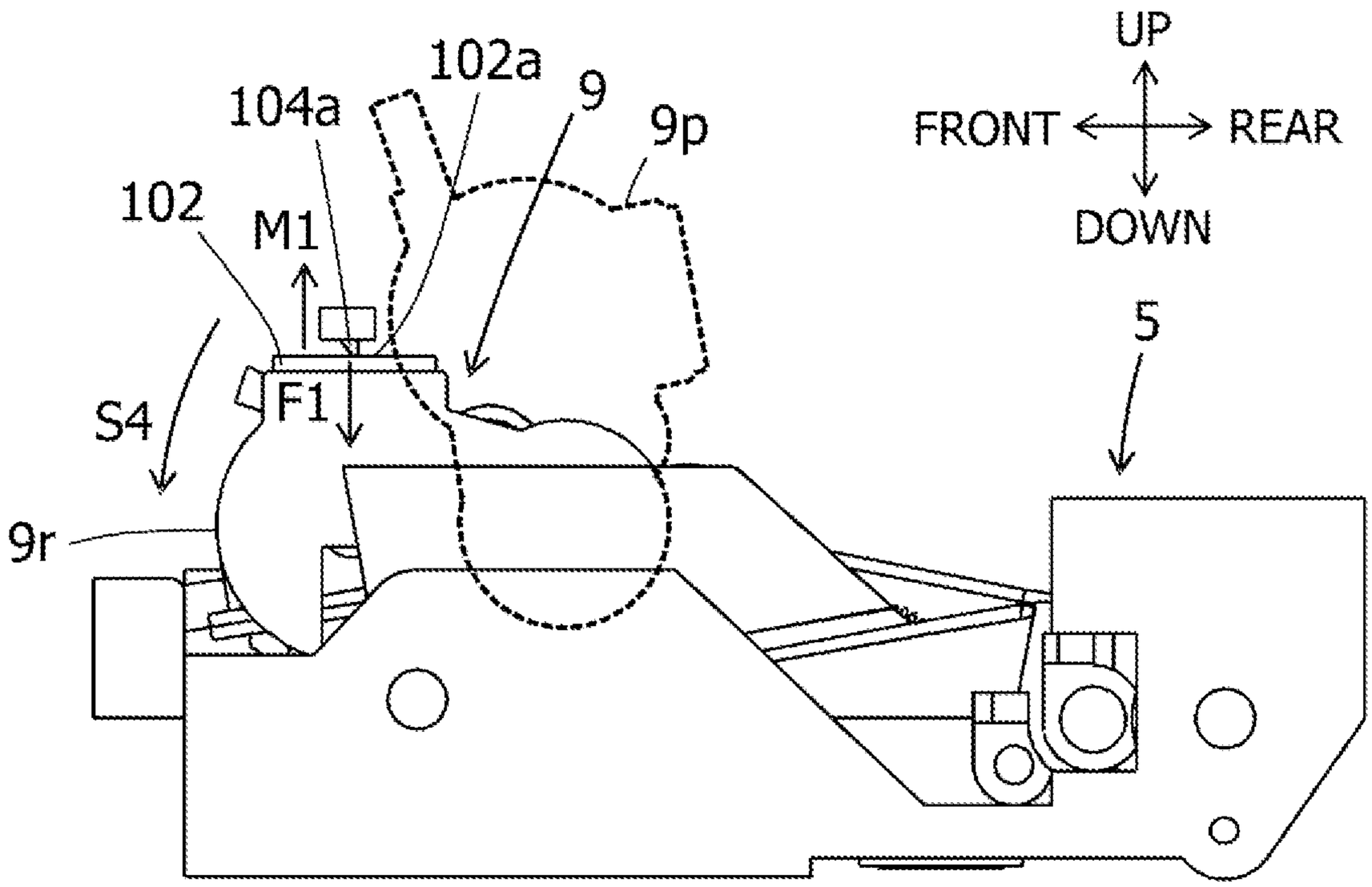
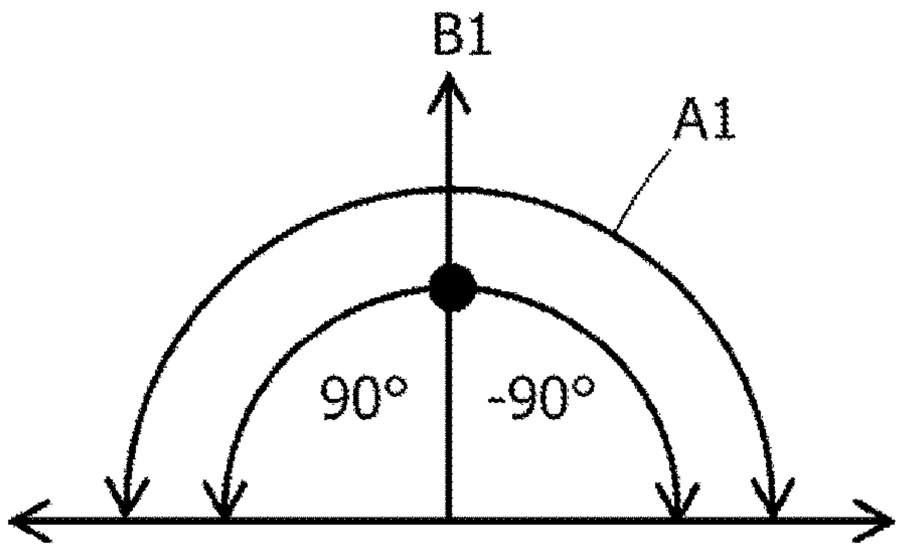


FIG.23A



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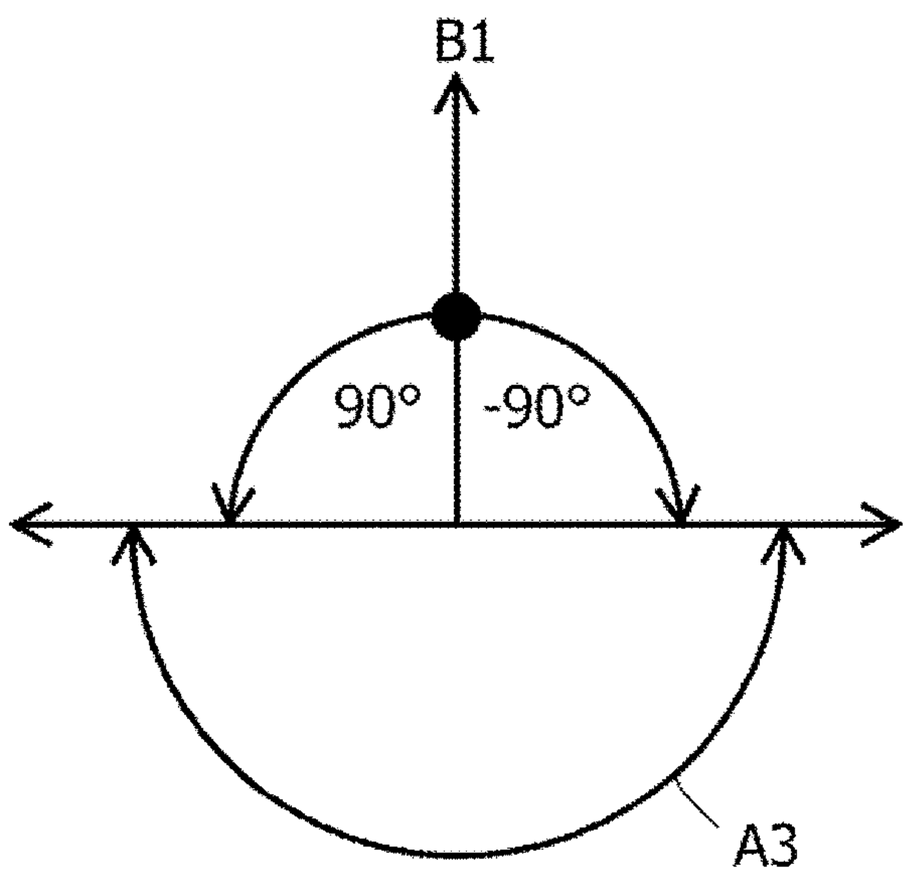

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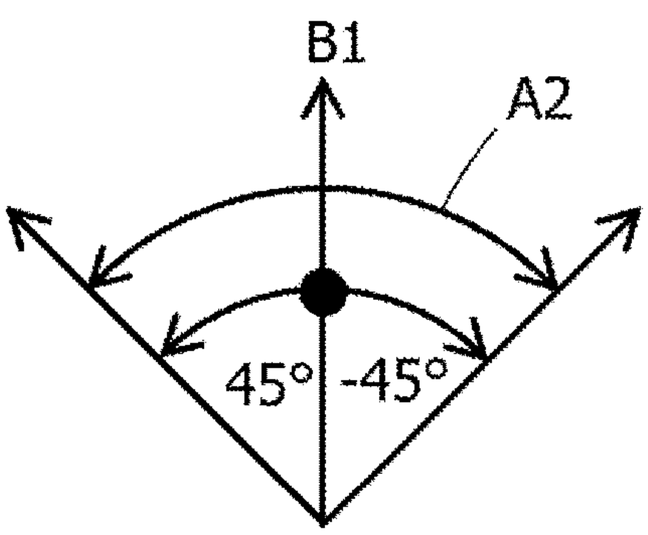

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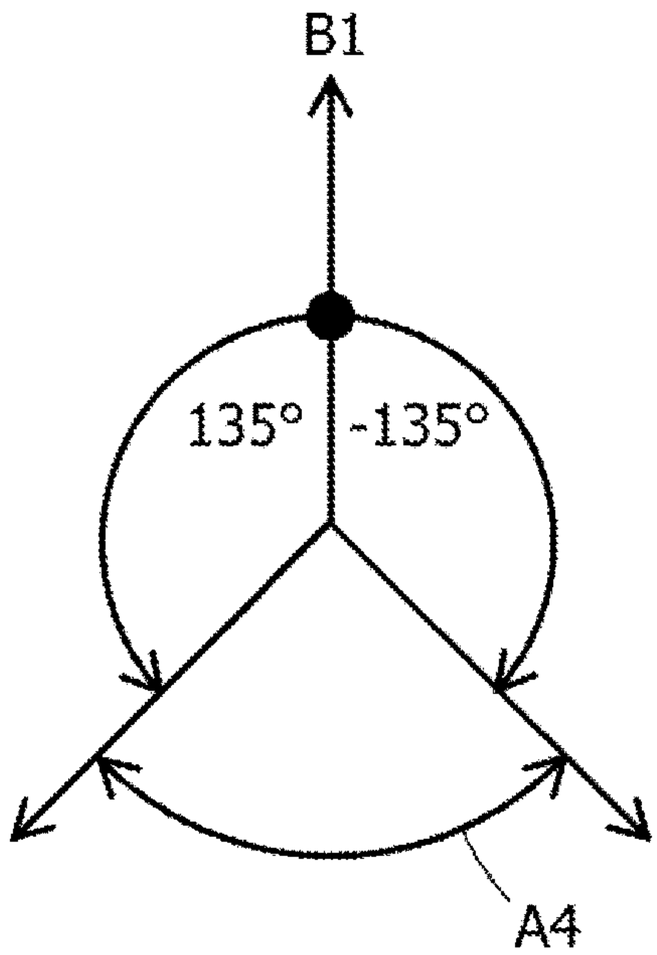

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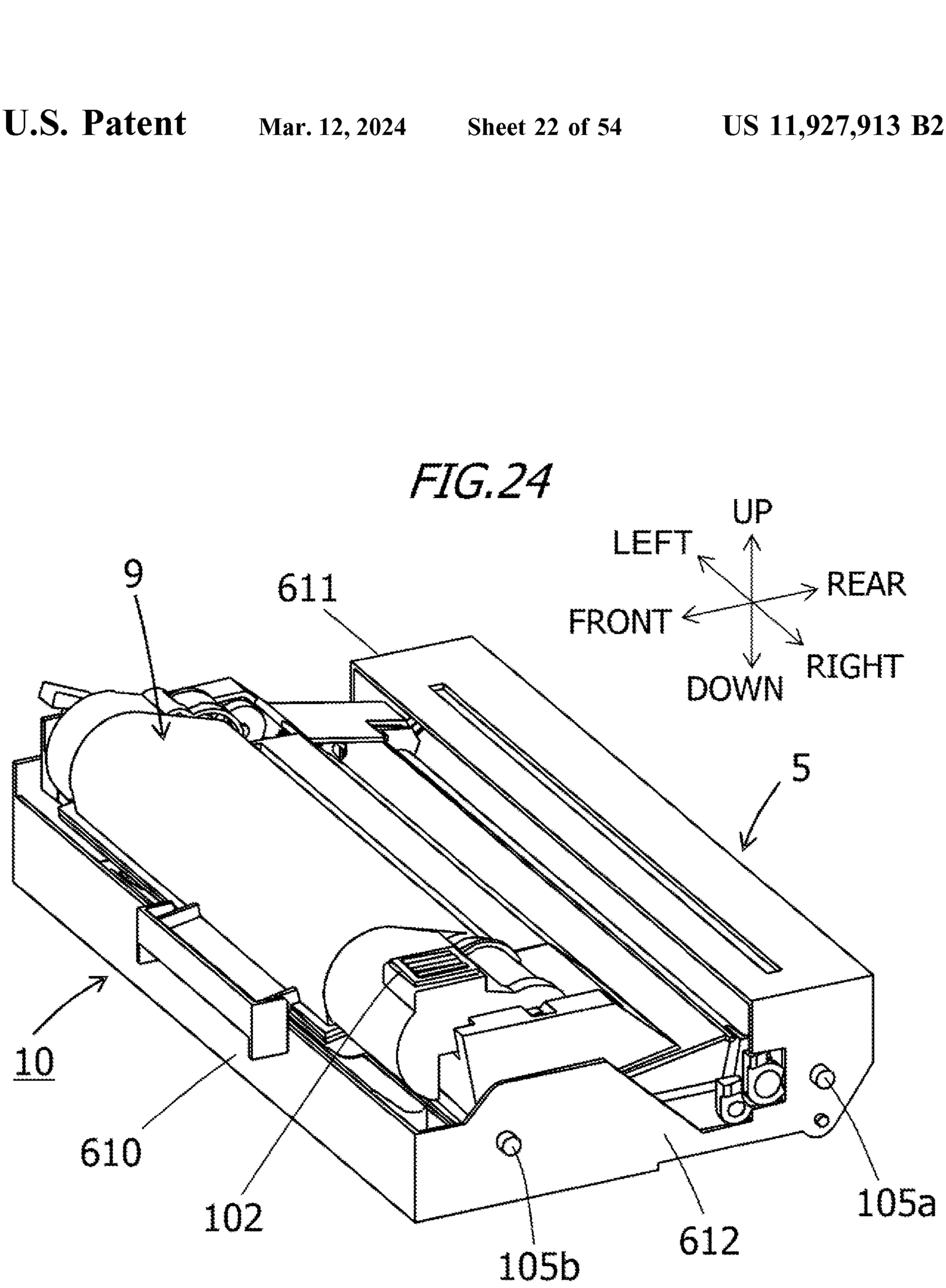

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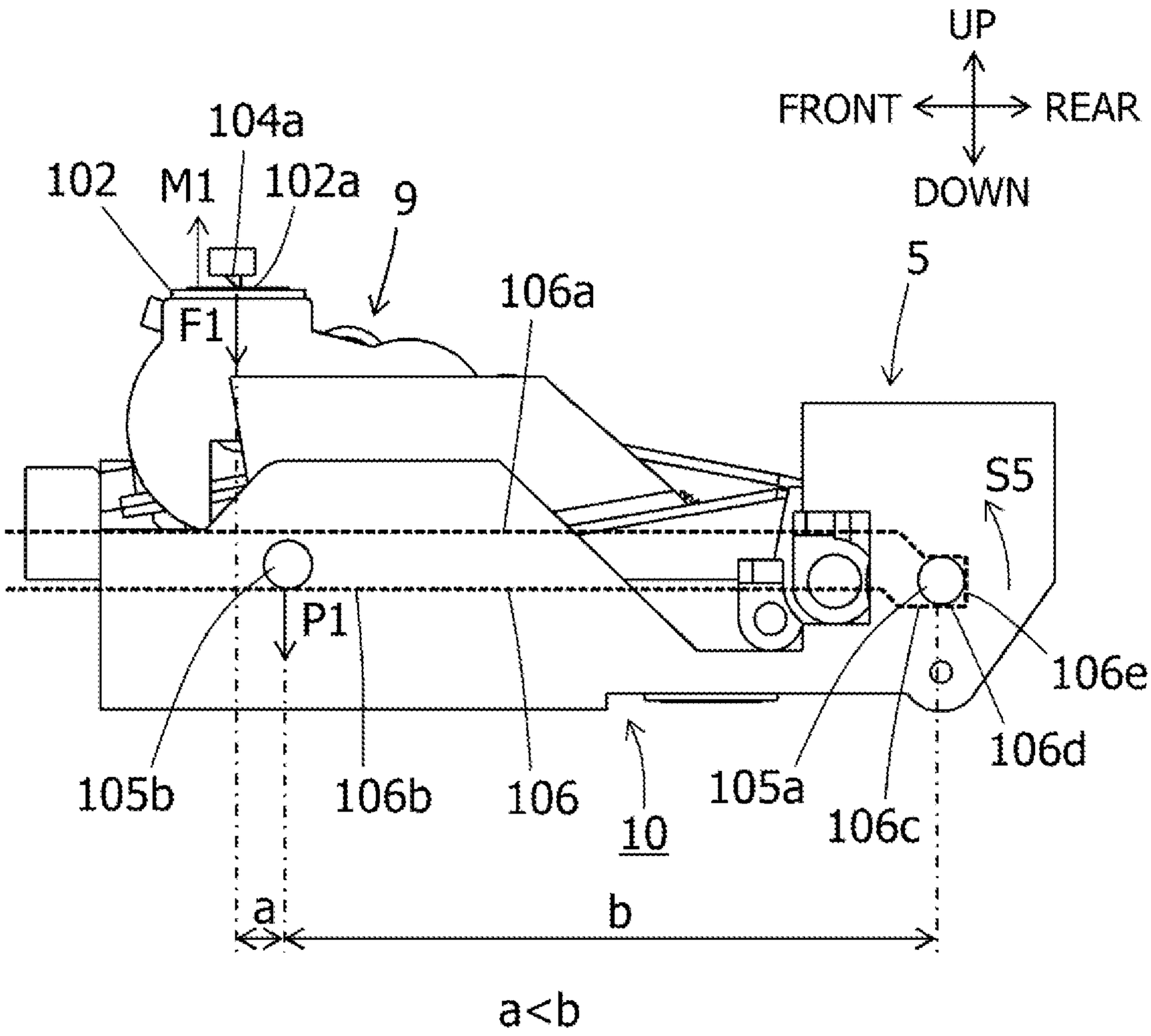
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FIG.26

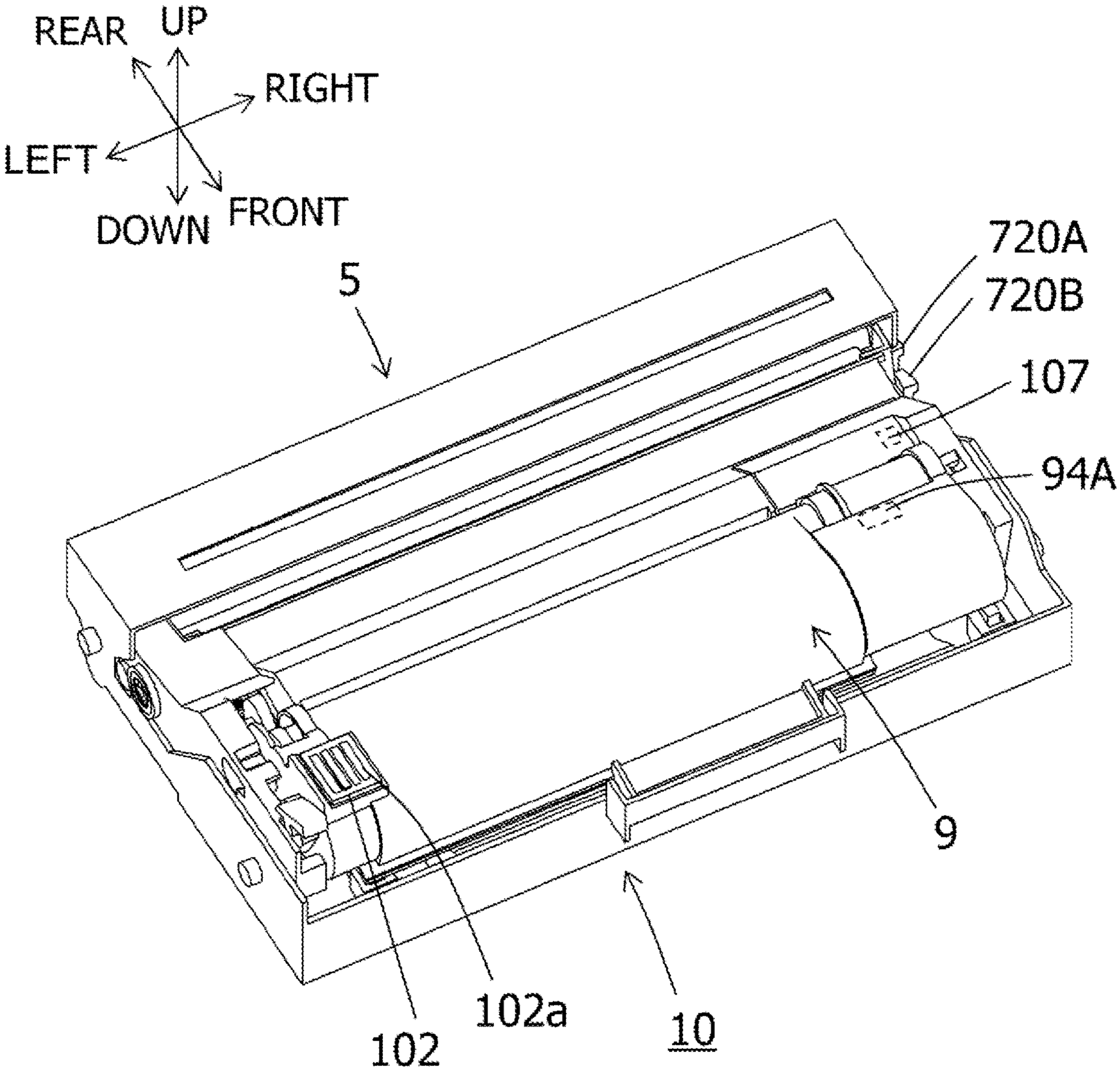


FIG.27

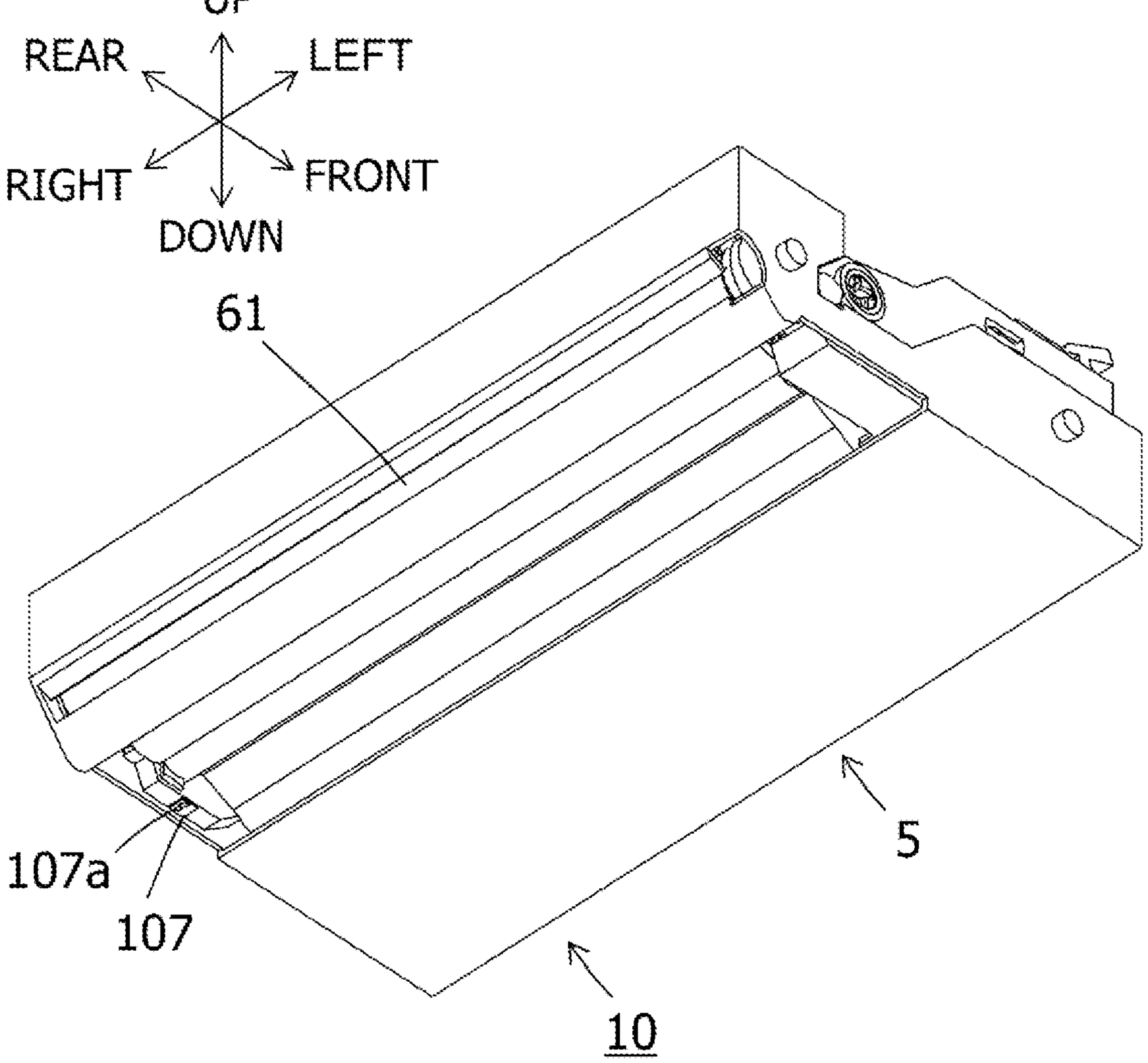


FIG.28

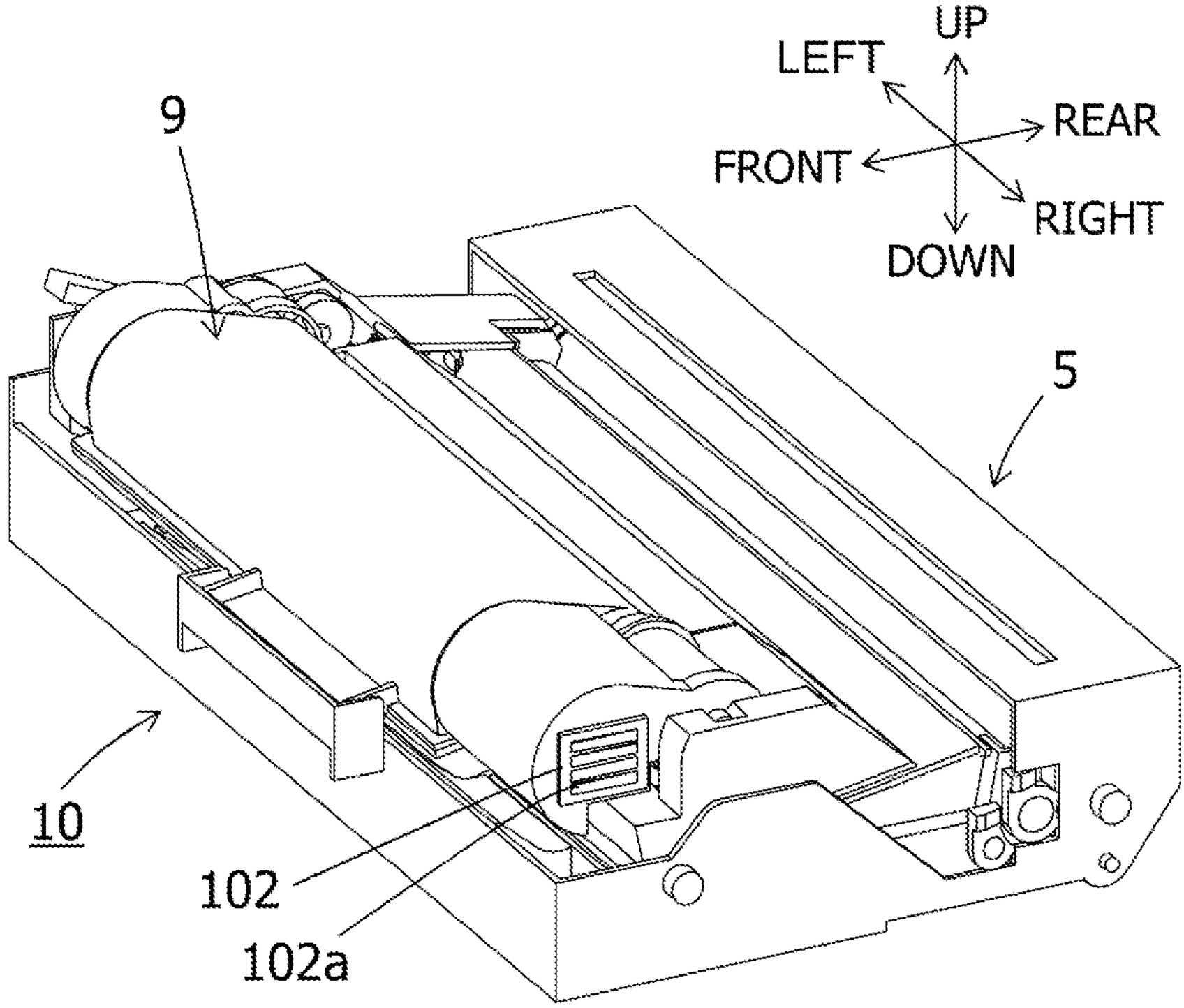


FIG.29

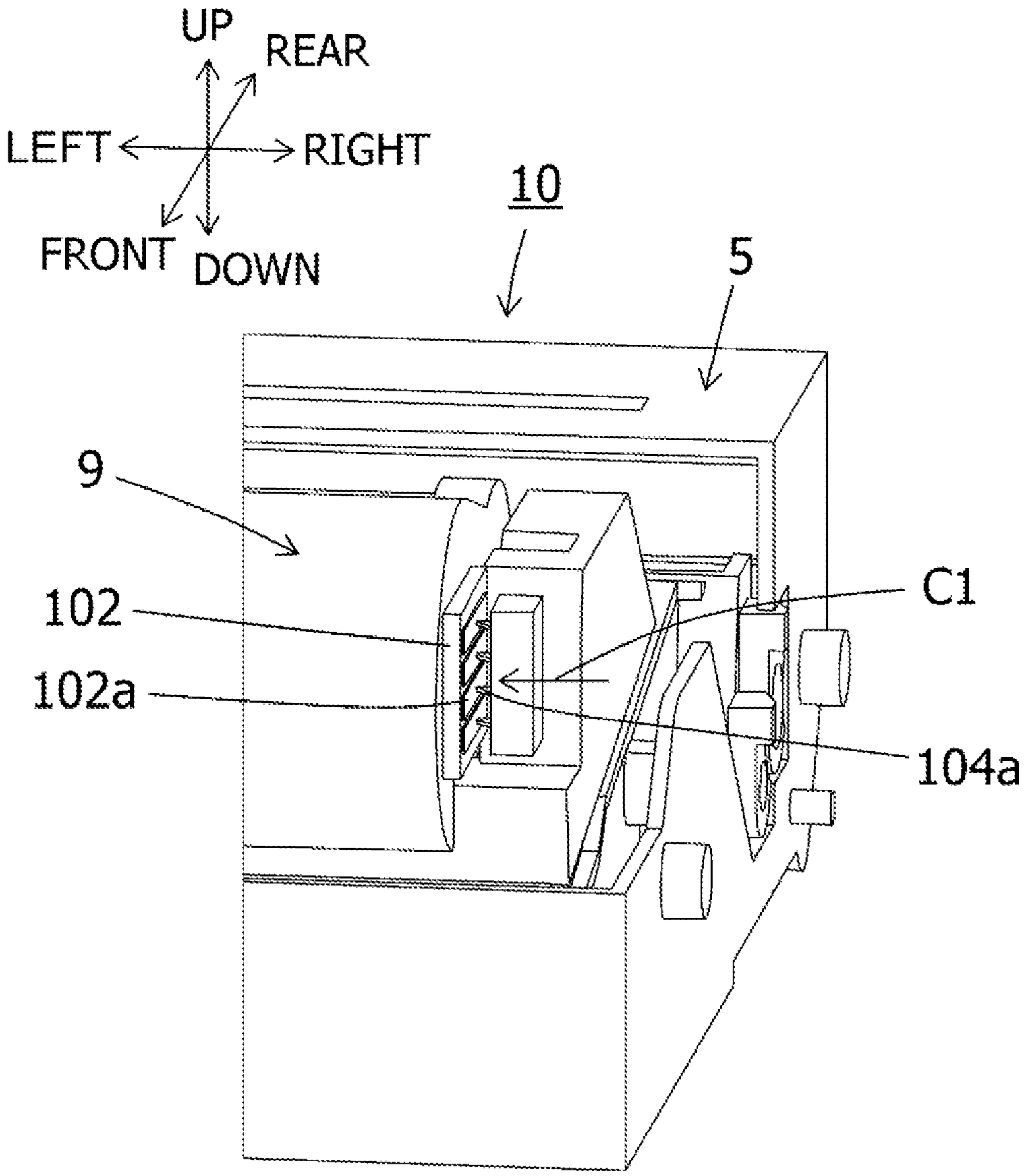


FIG.30

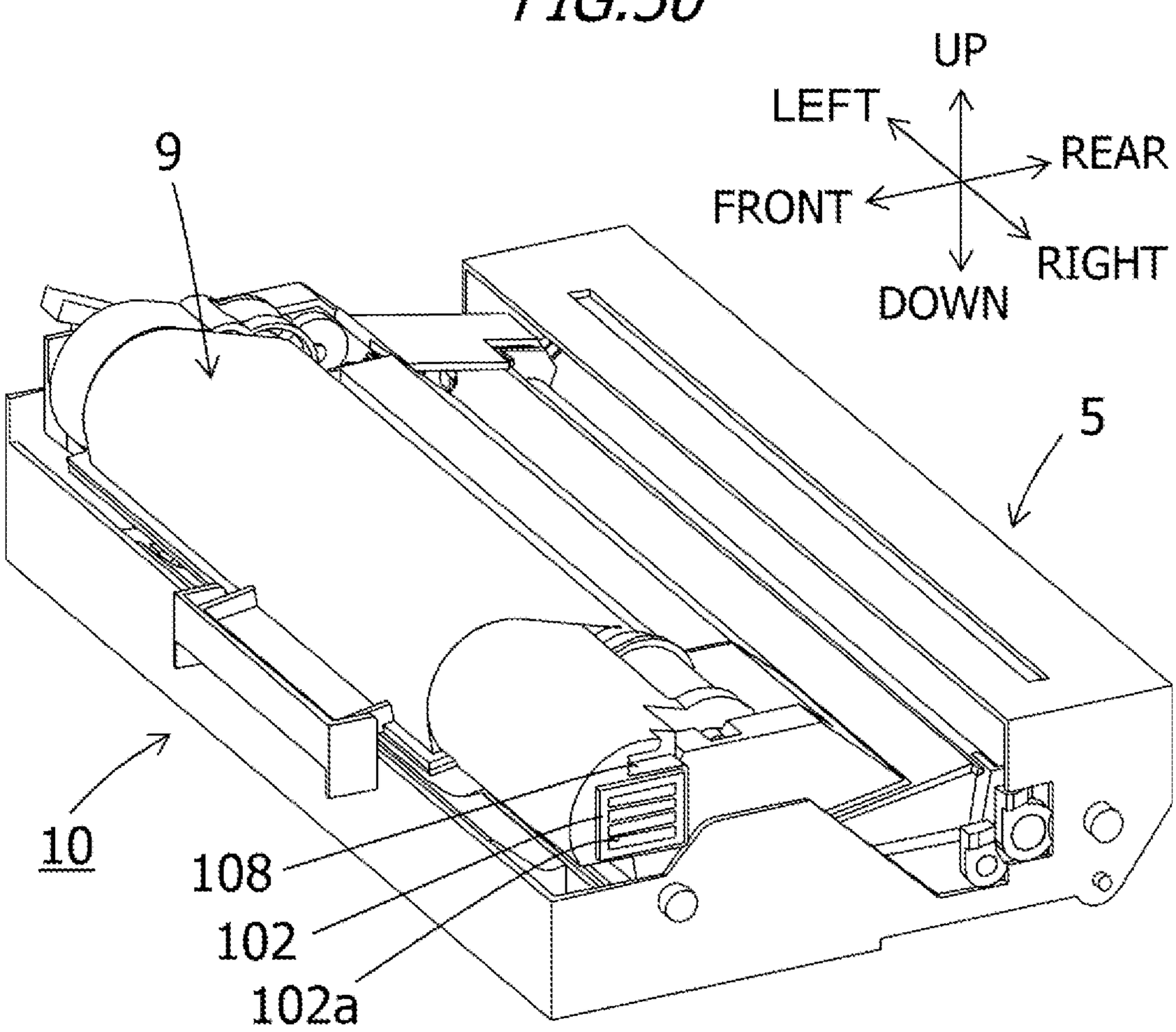


FIG.31

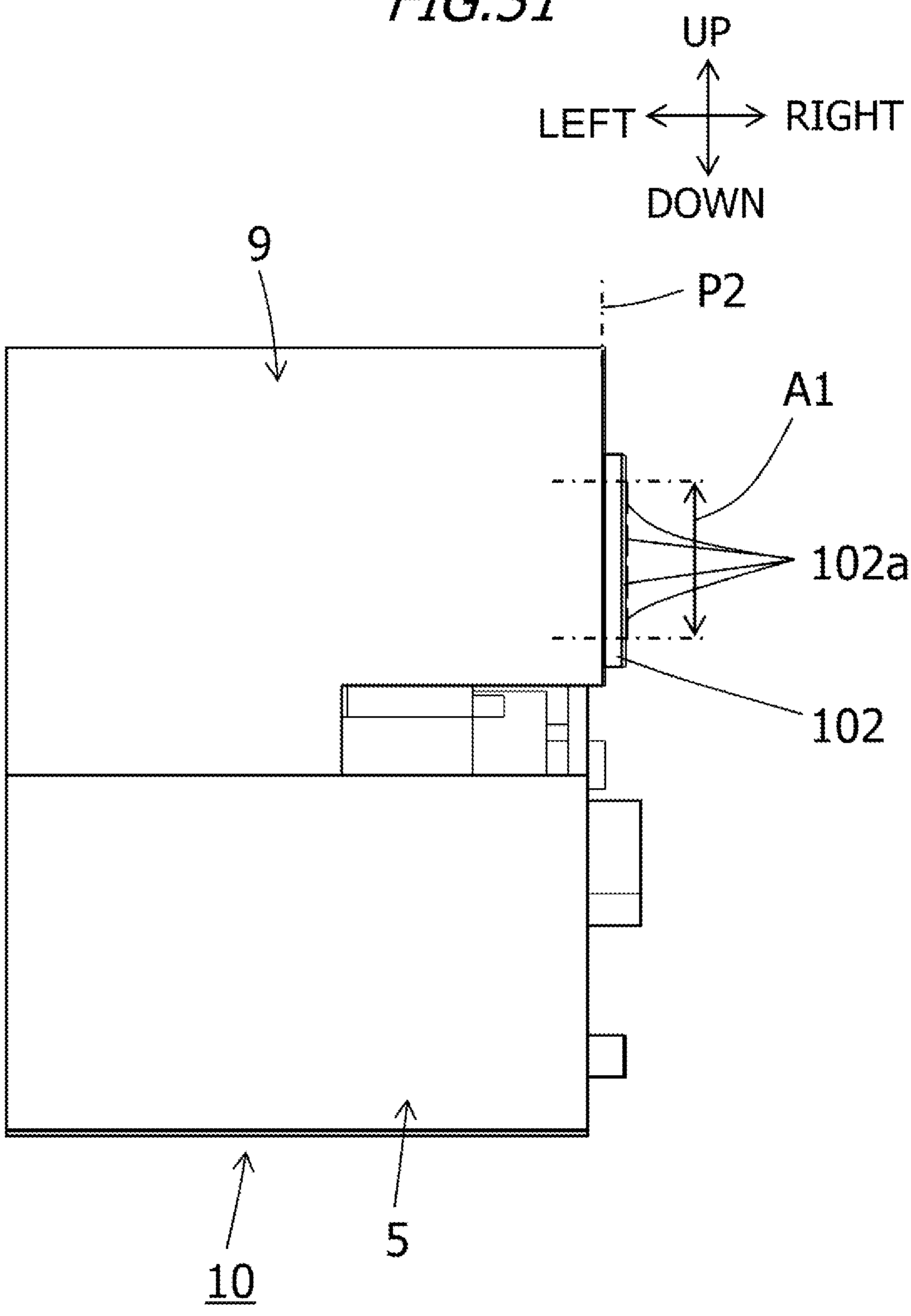


FIG.32

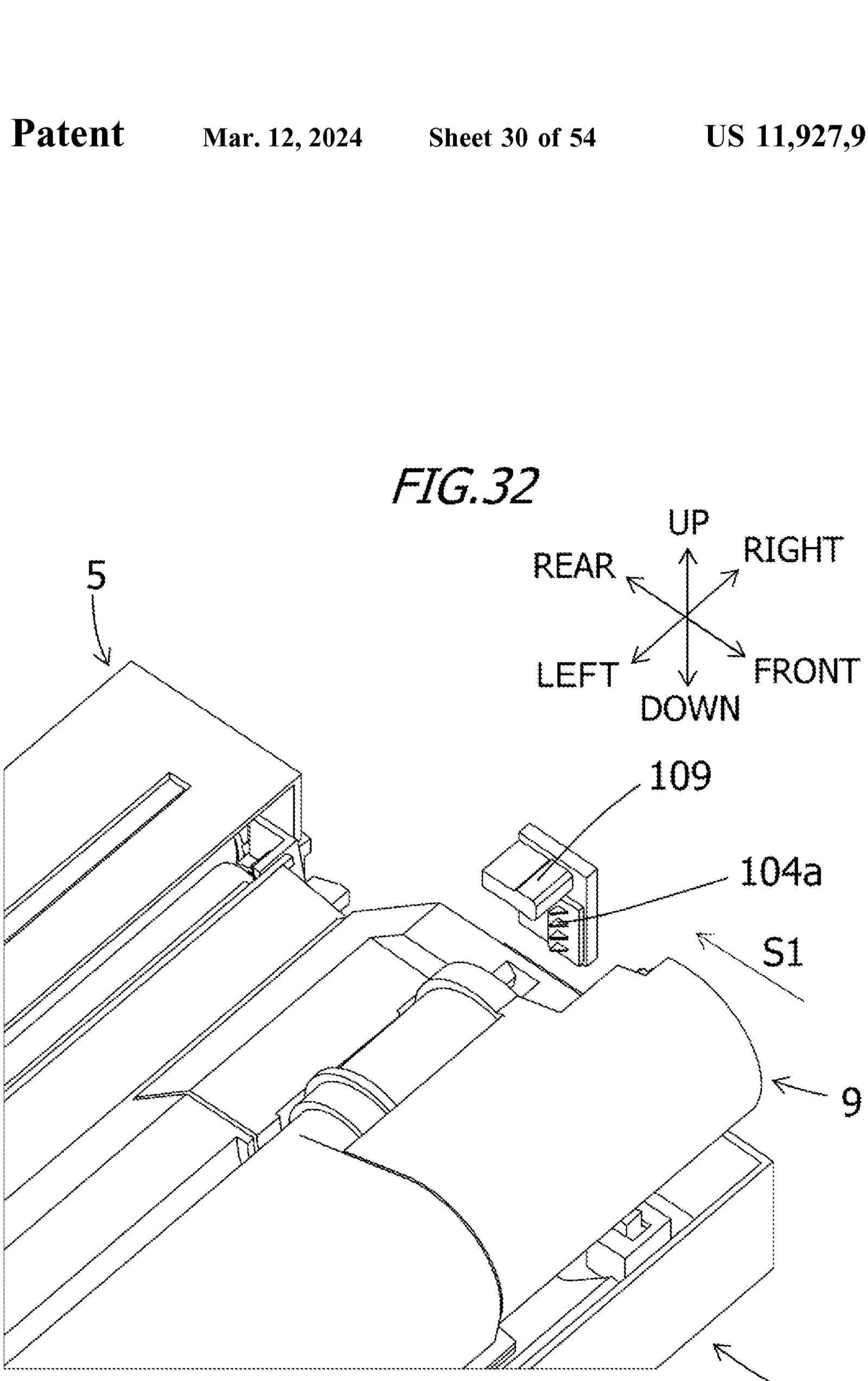


FIG.33

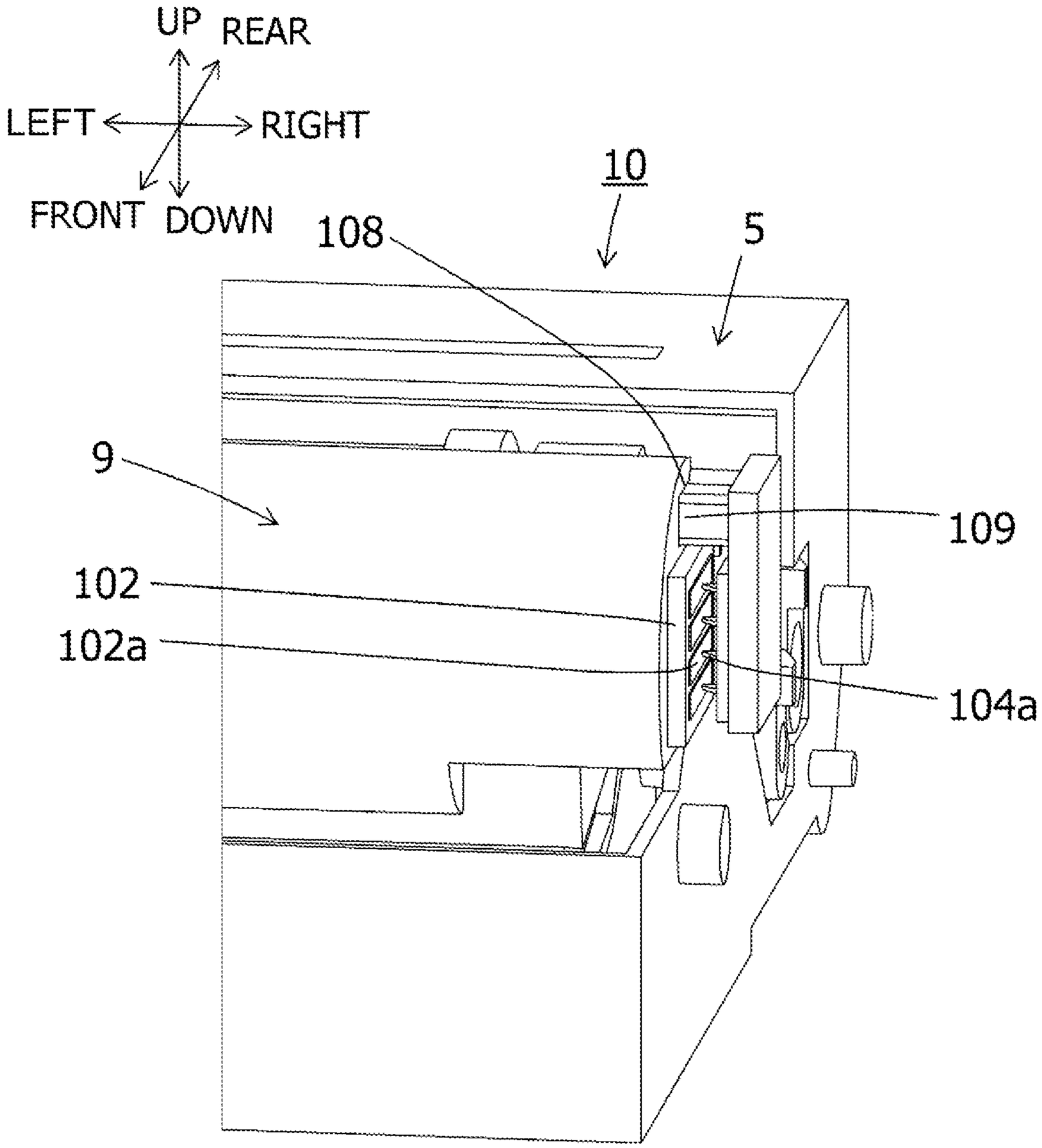


FIG.34

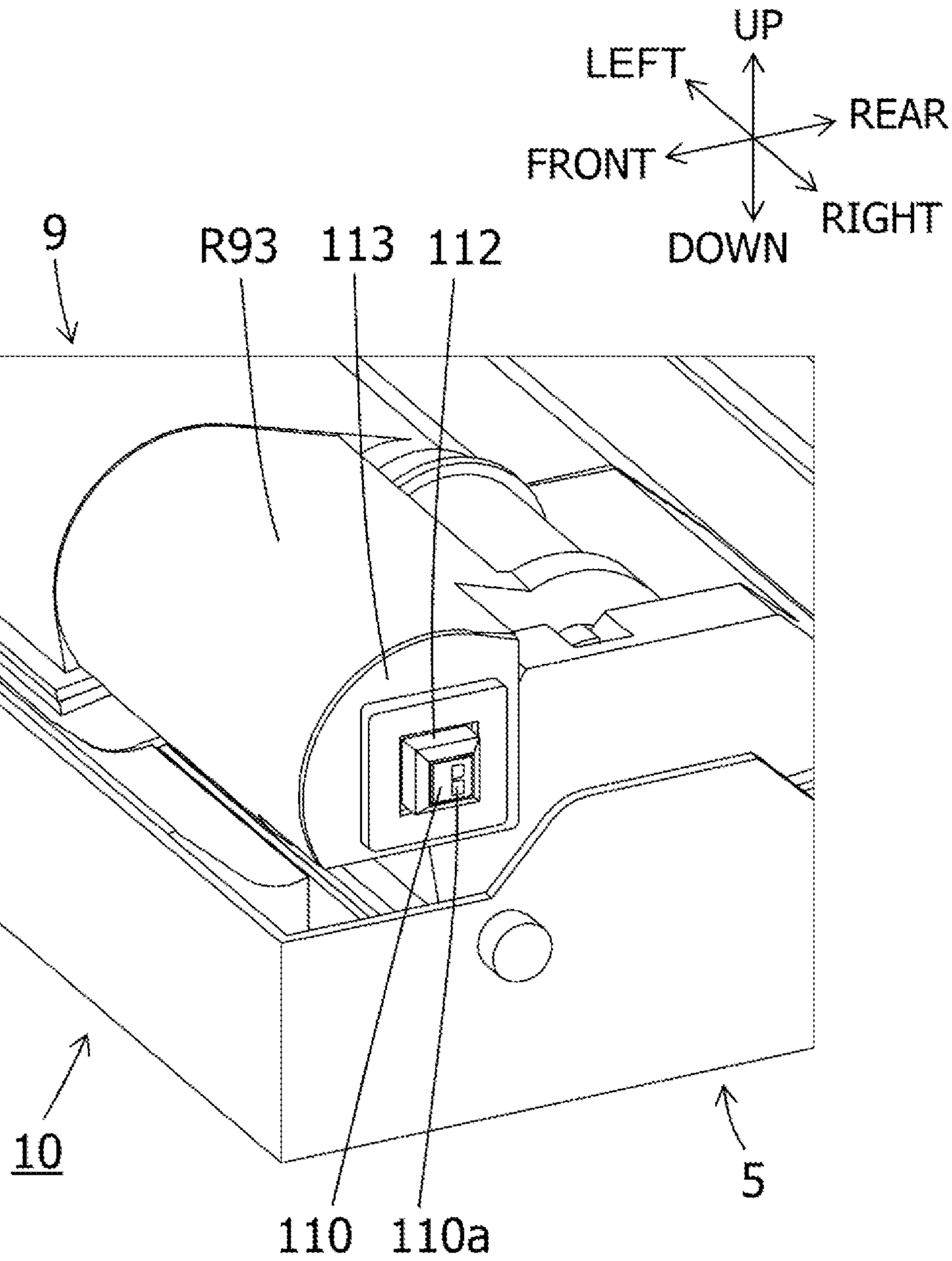


FIG.35

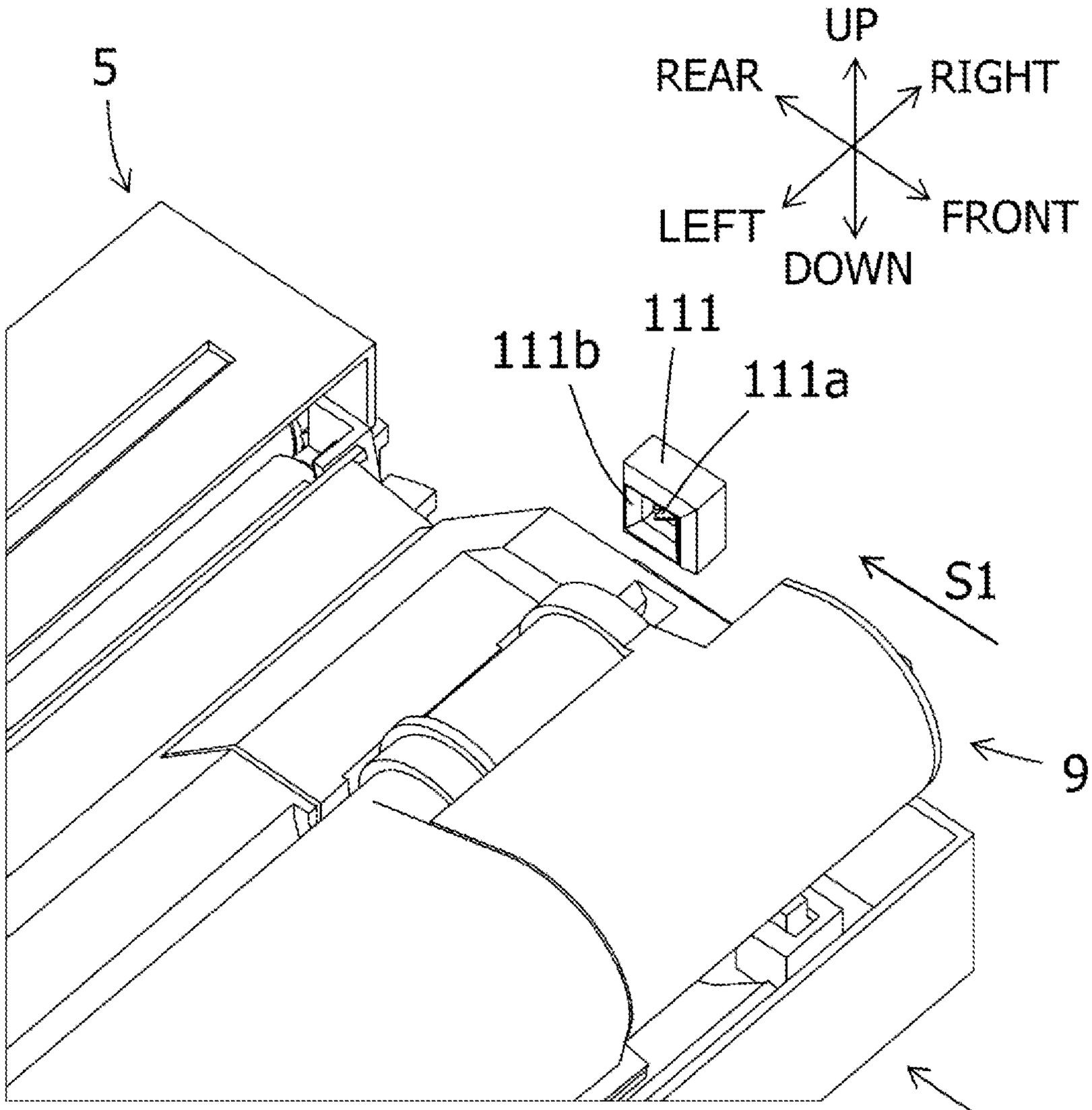


FIG.36

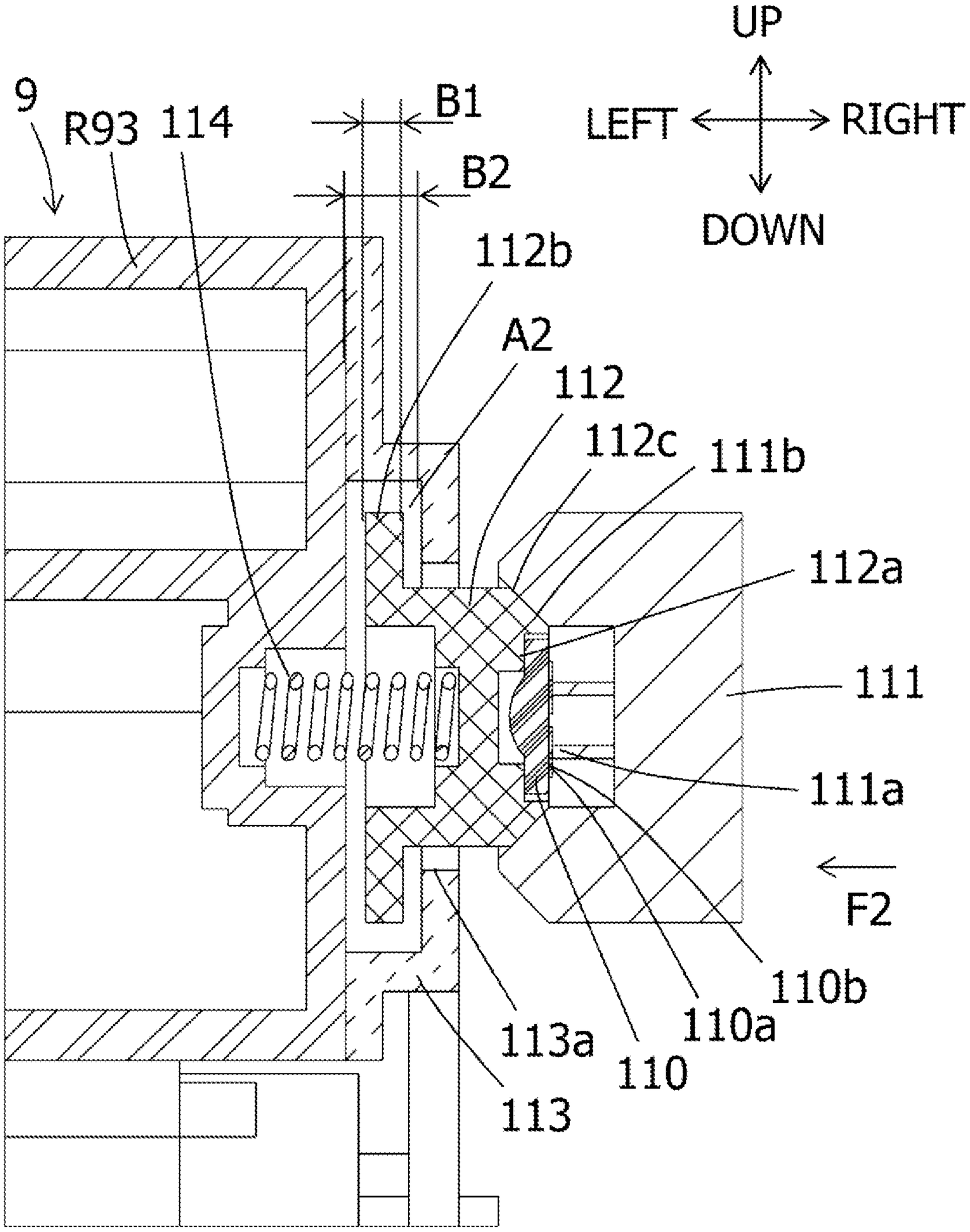

UP
LEFT
RIGHT
DOWN
9
R93
114
B1
B2
112b
A2
112
112c
111b
112a
111
111a
F2
110b
110a
110
113a
113

FIG.37

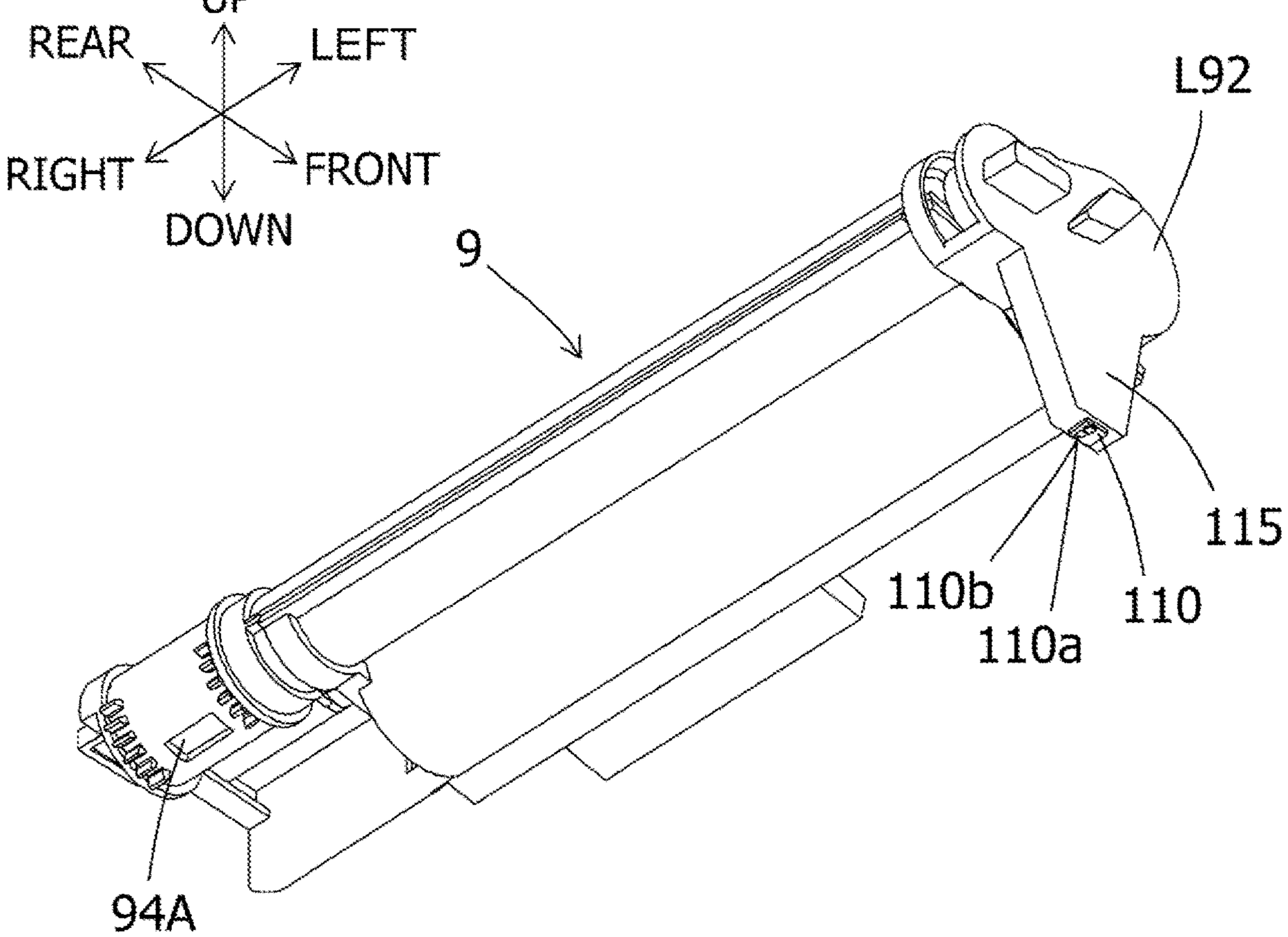


FIG.38

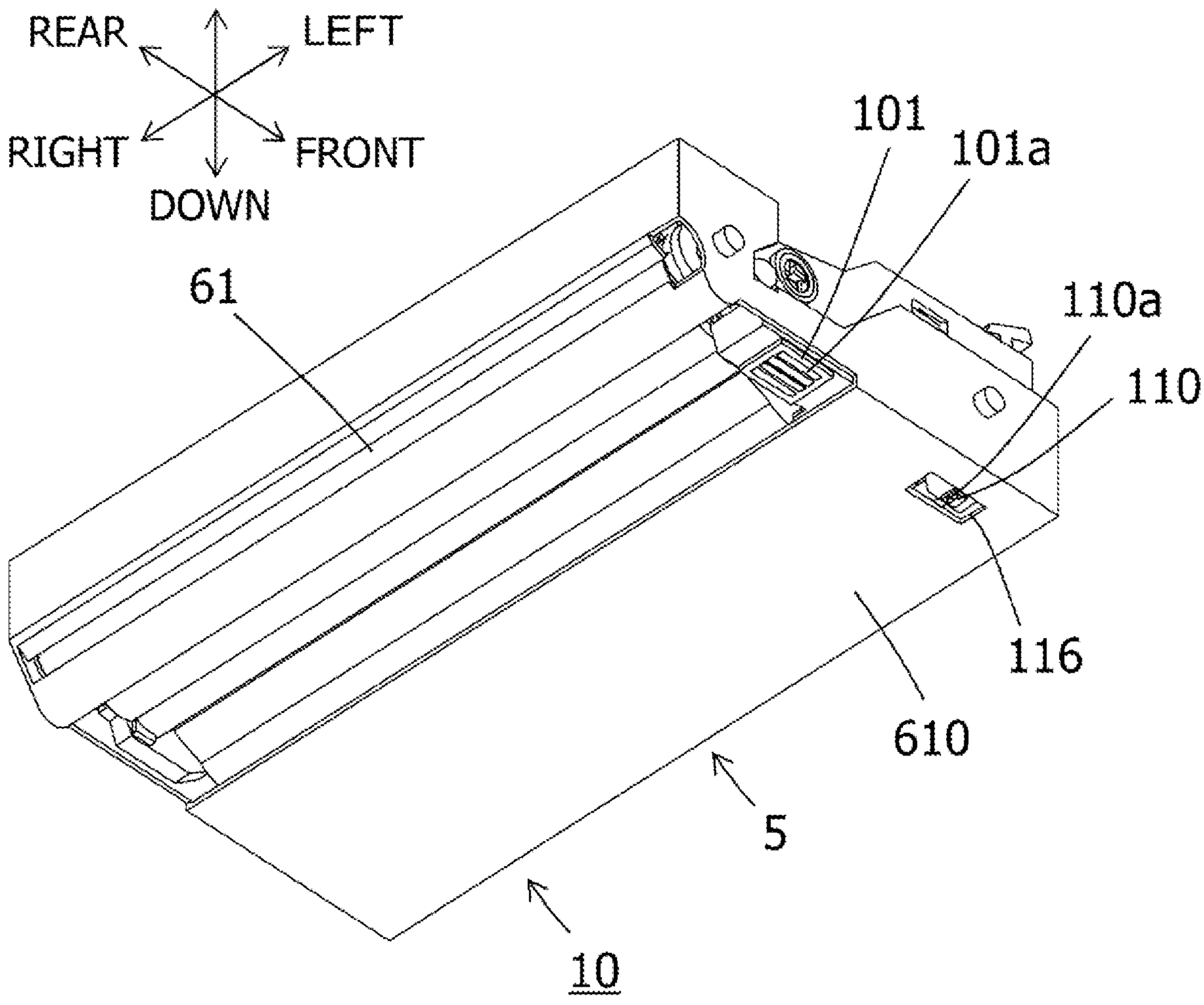


FIG.39

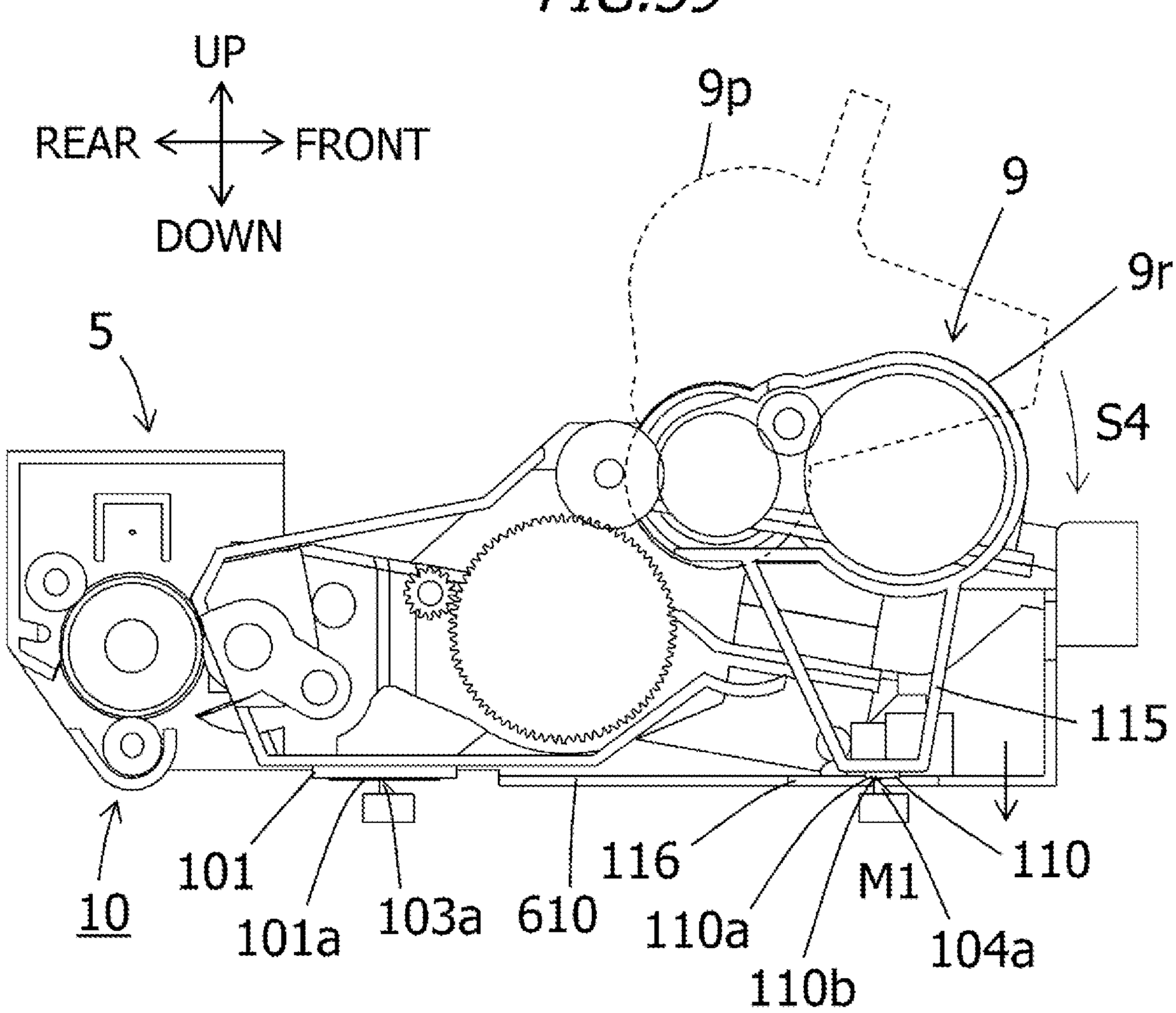

UP
REAR
FRONT
DOWN
9p
9
9r
5
S4
115
10
101
101a
103a
610
116
110a
110b
M1
104a
110

FIG. 40

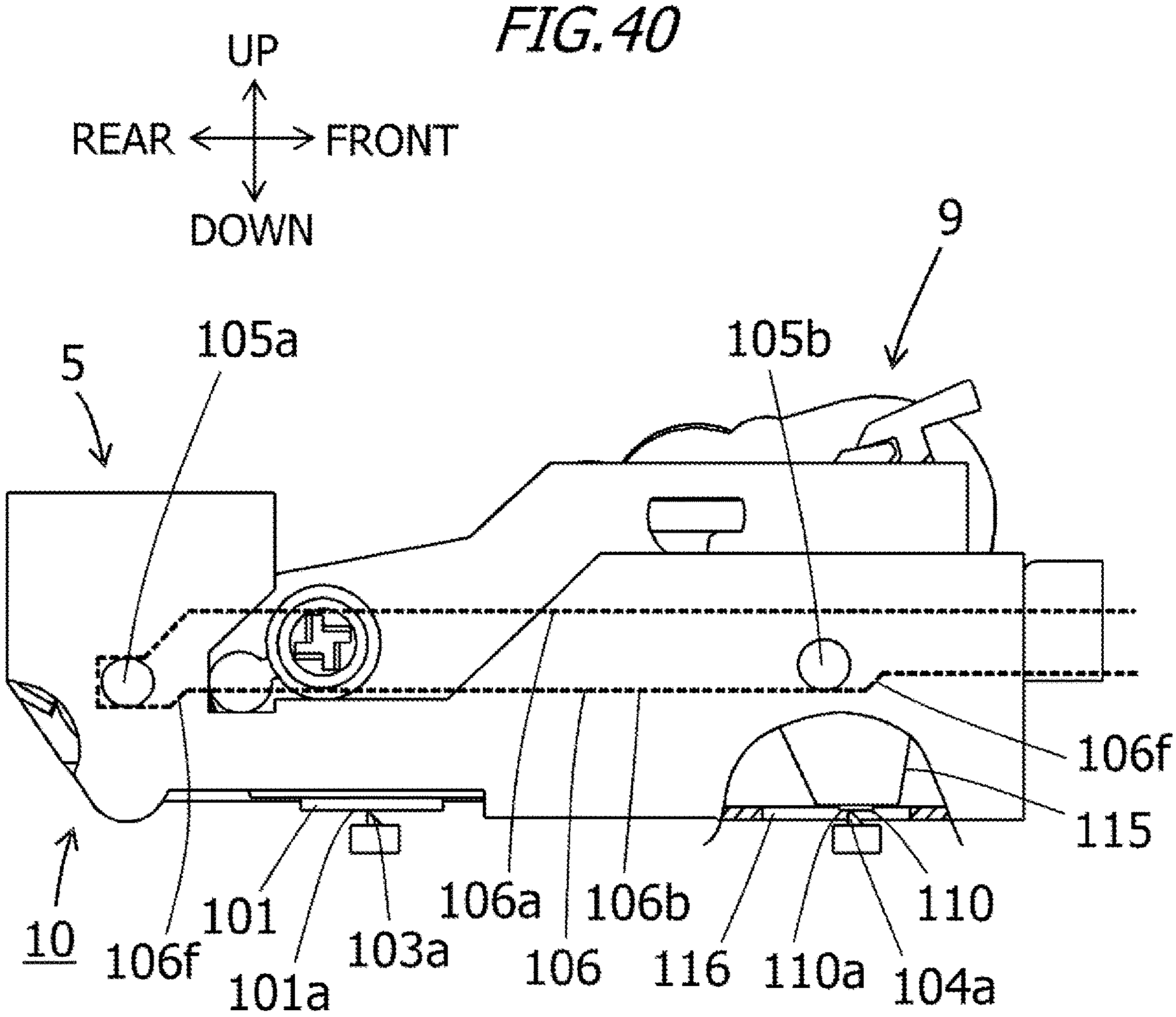

UP
REAR
FRONT
DOWN
9
105a
105b
5
106f
115
10
106f
101
101a
103a
106a
106
106b
116
110a
110
104a

FIG.41

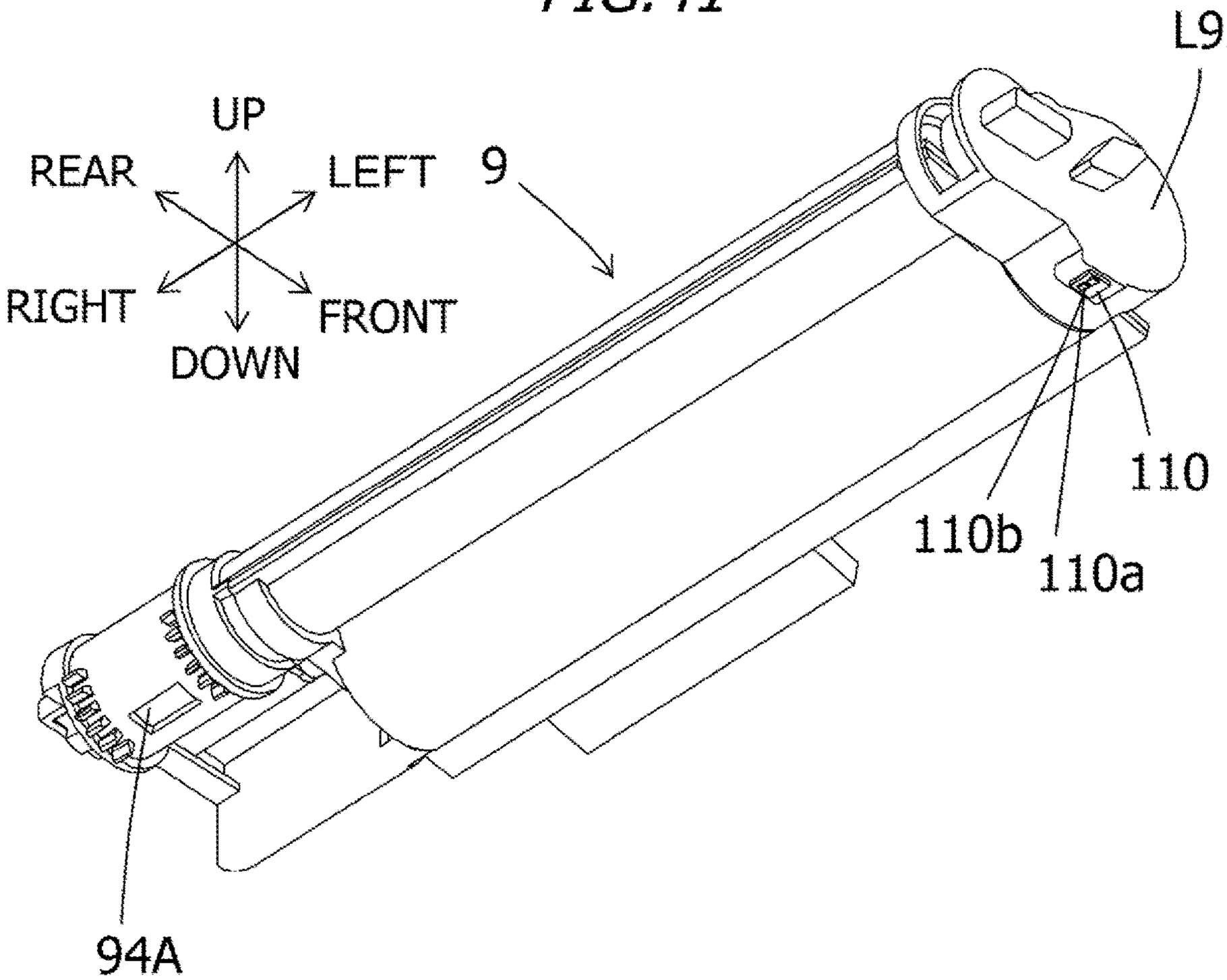


FIG.42

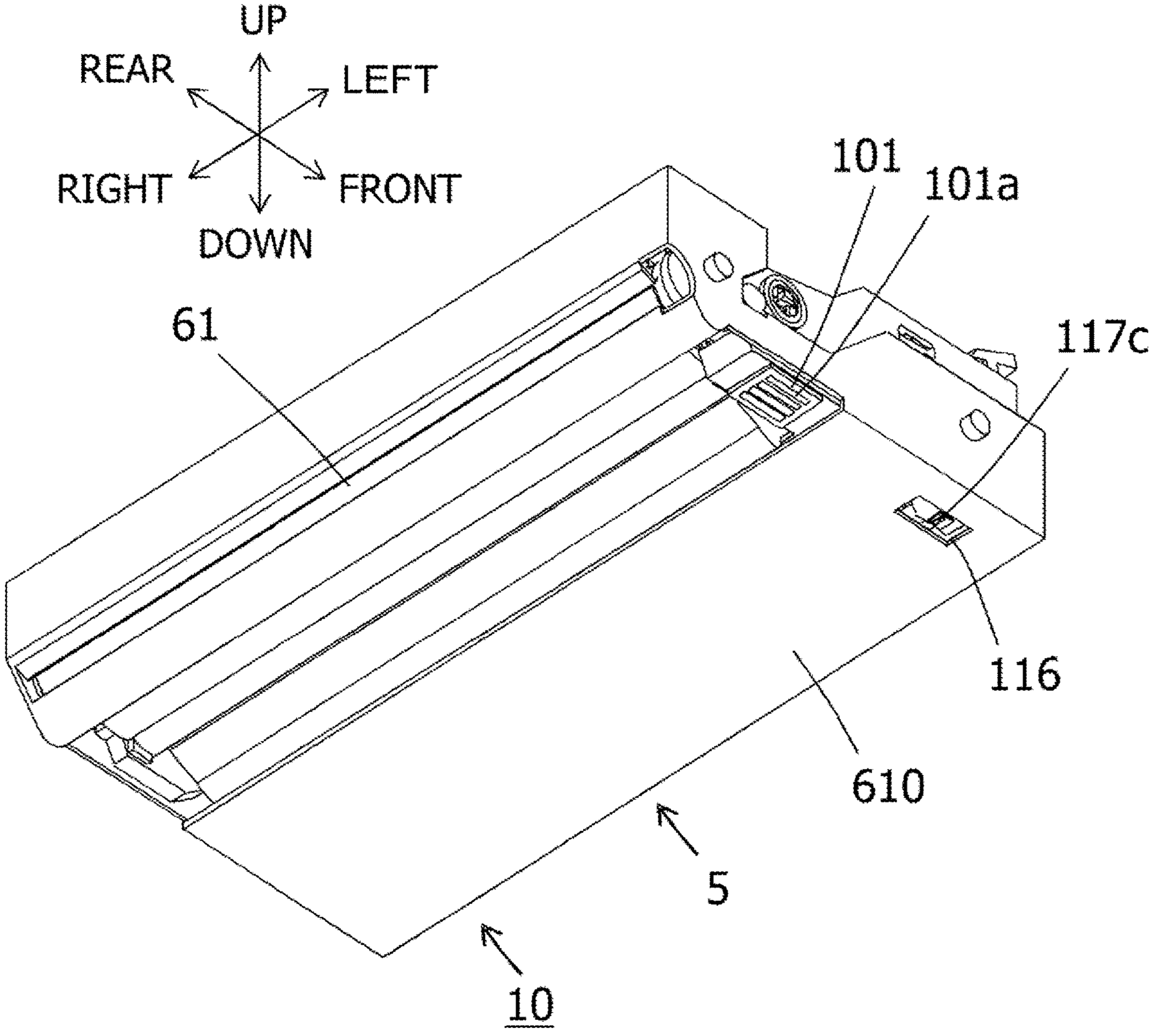


FIG.43

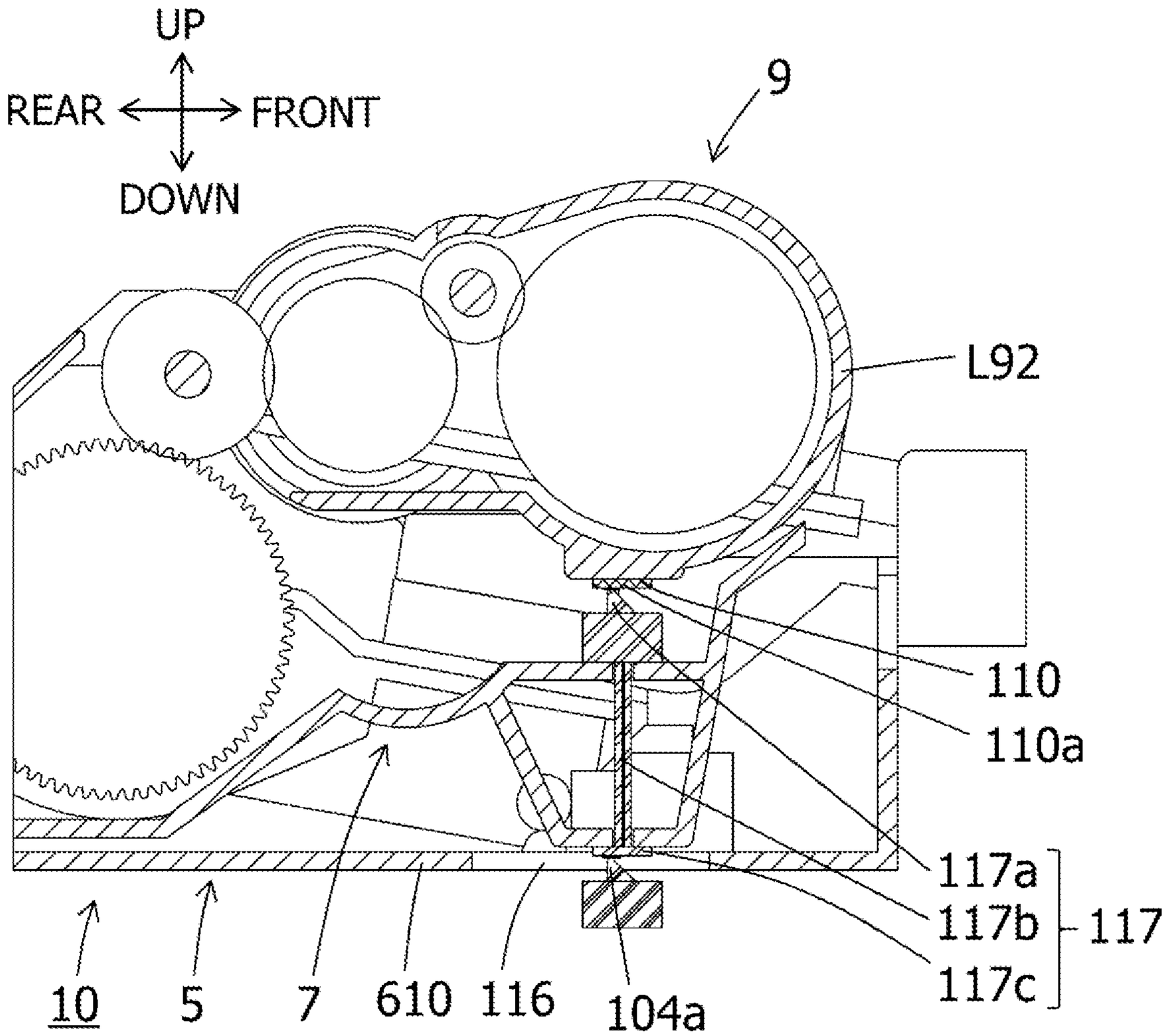

UP
REAR
FRONT
DOWN
9
L92
110
110a
117a
117b
117c
117
10
5
7
610
116
104a

FIG. 44

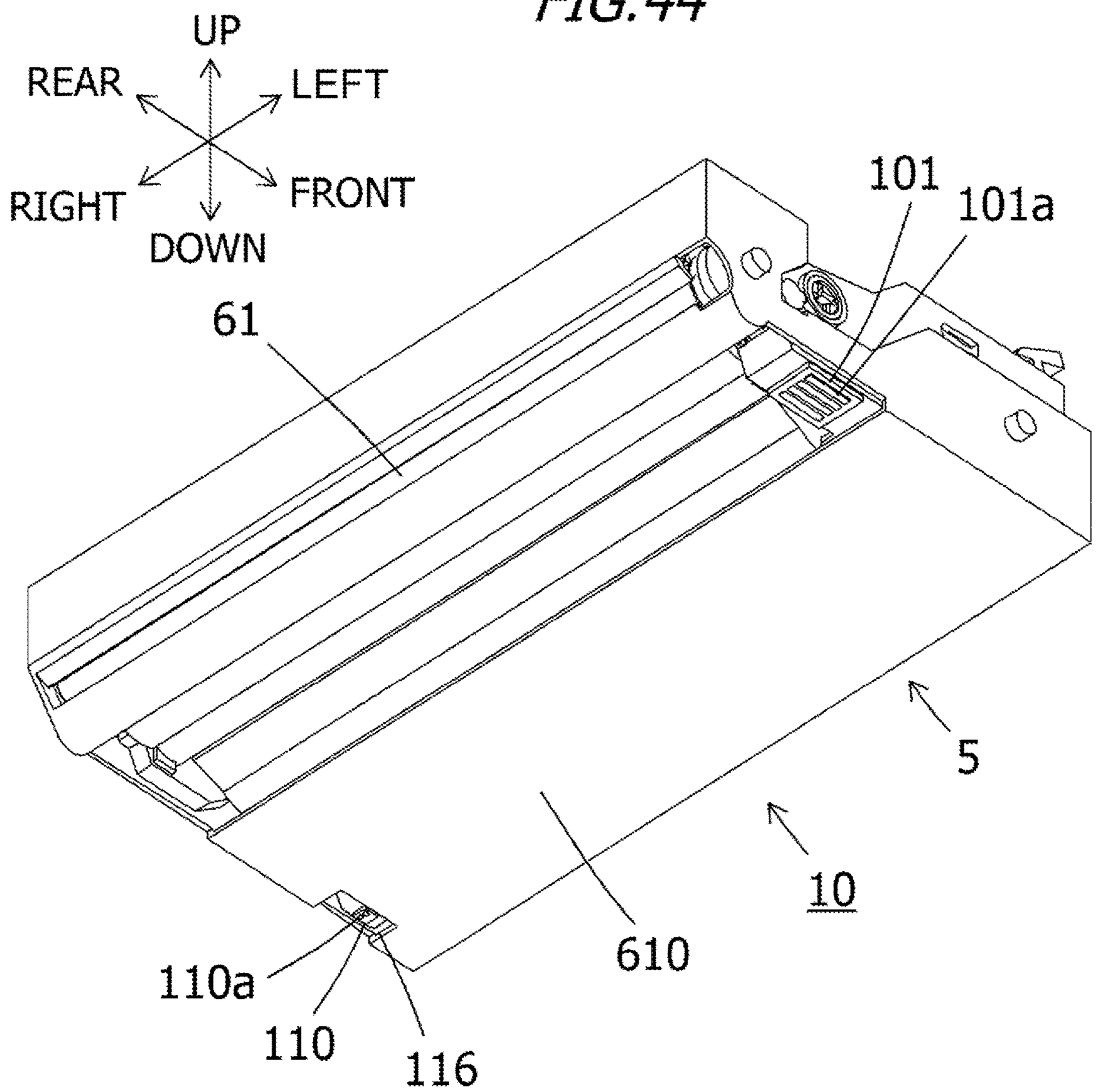


FIG.45

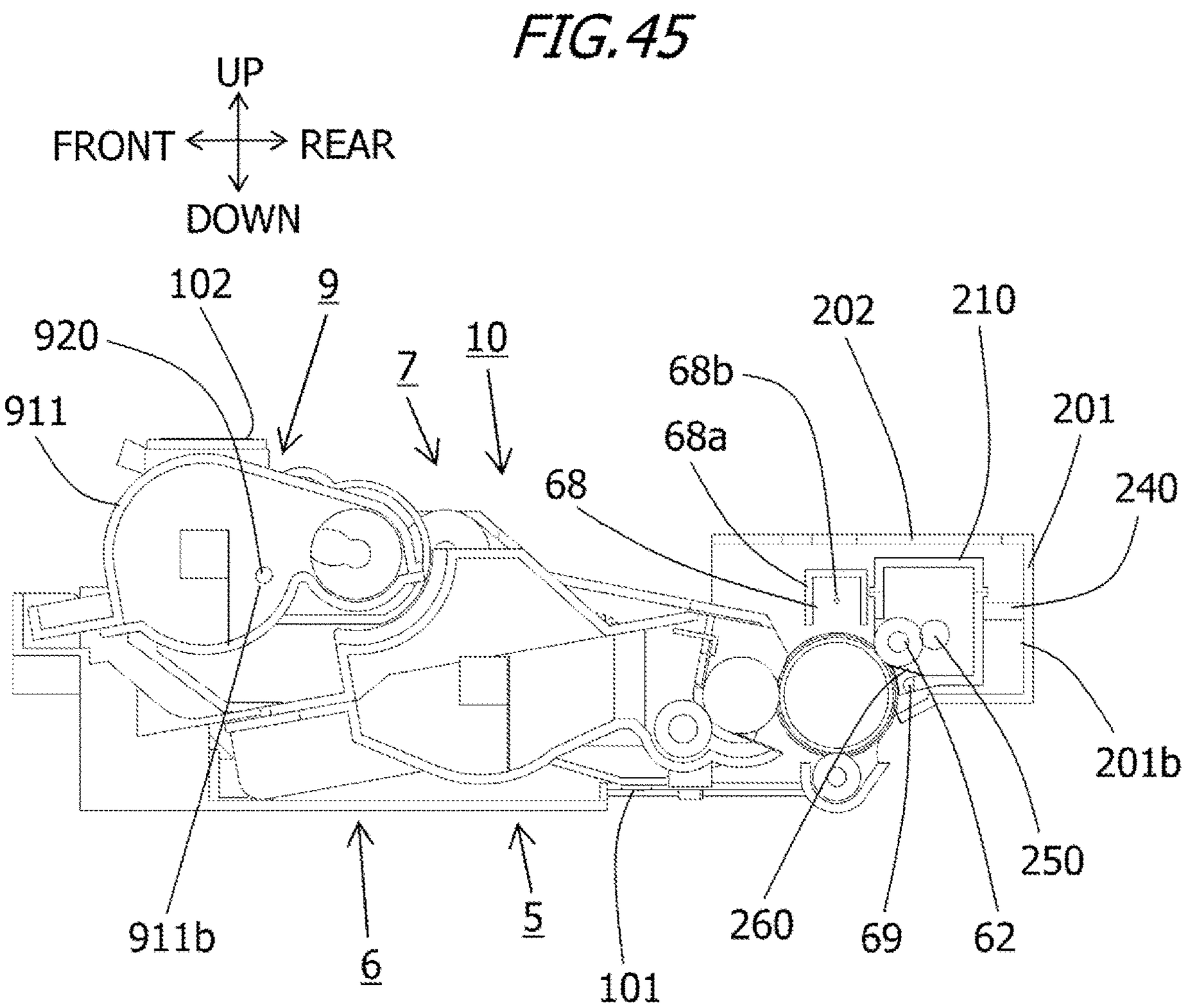

UP
FRONT
REAR
DOWN
102
9
920
10
7
911
202
210
68b
201
68a
240
68
201b
250
911b
6
5
101
260
69
62

FIG.46A

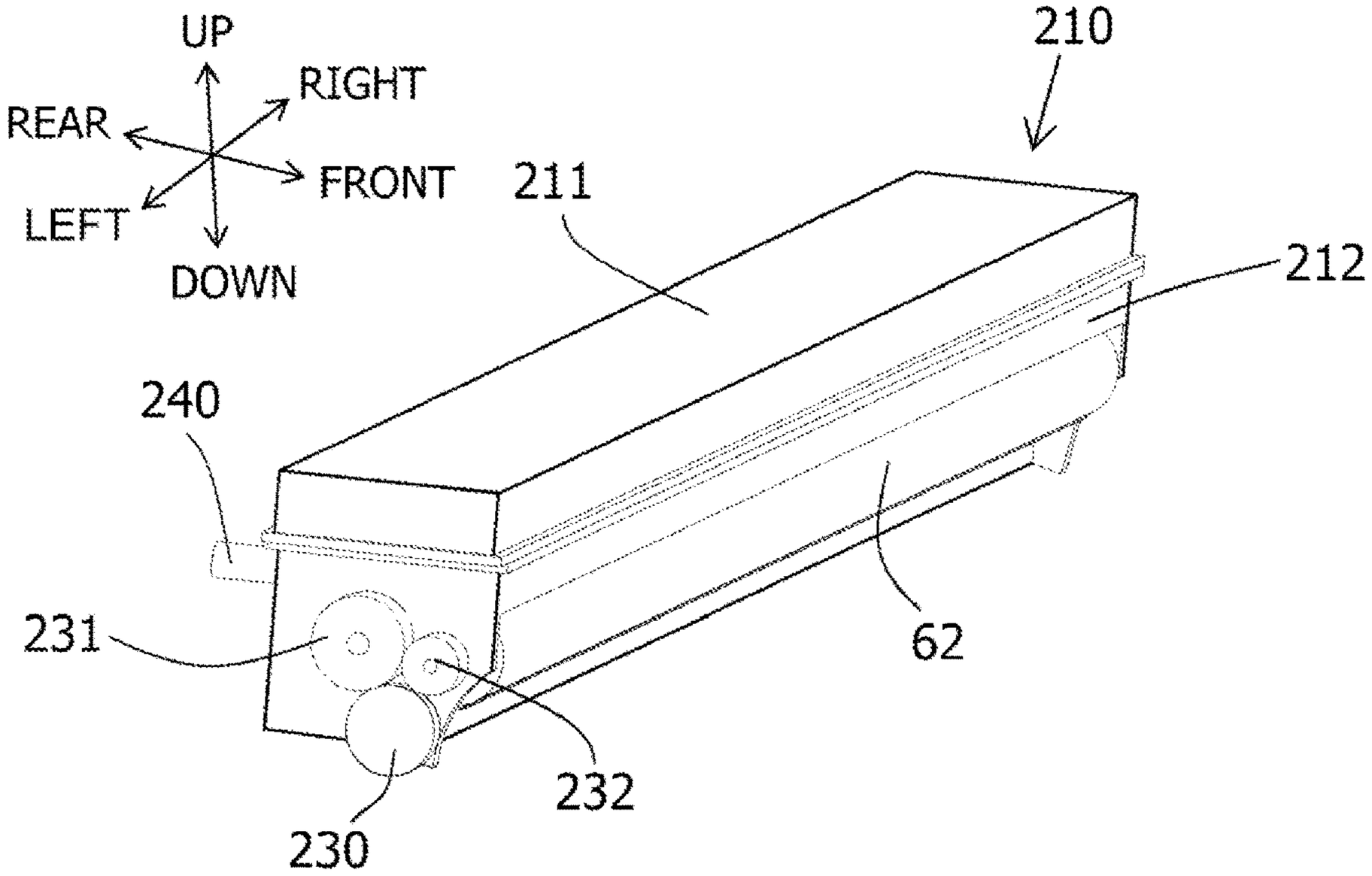


FIG.46B

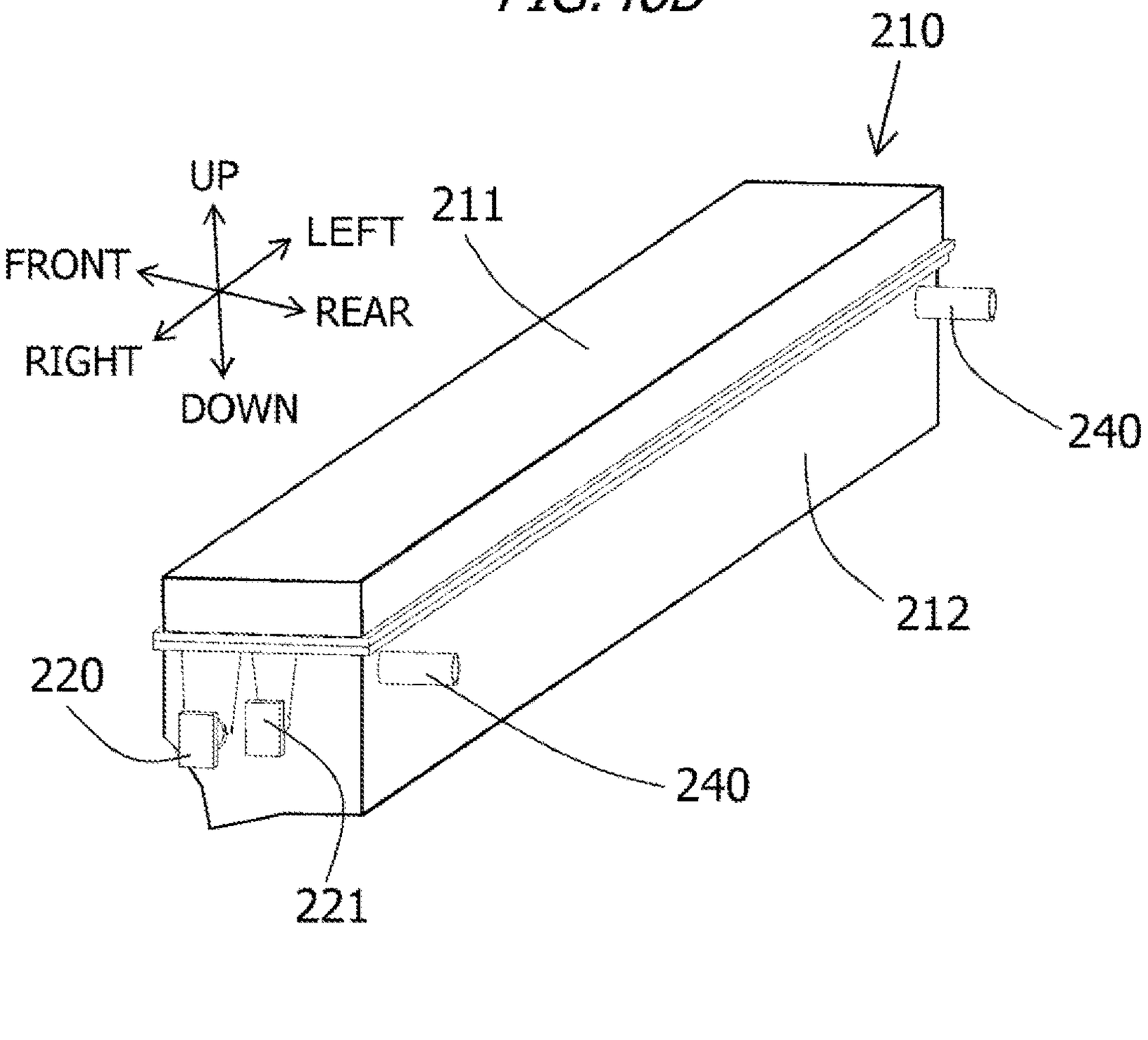


FIG.47A

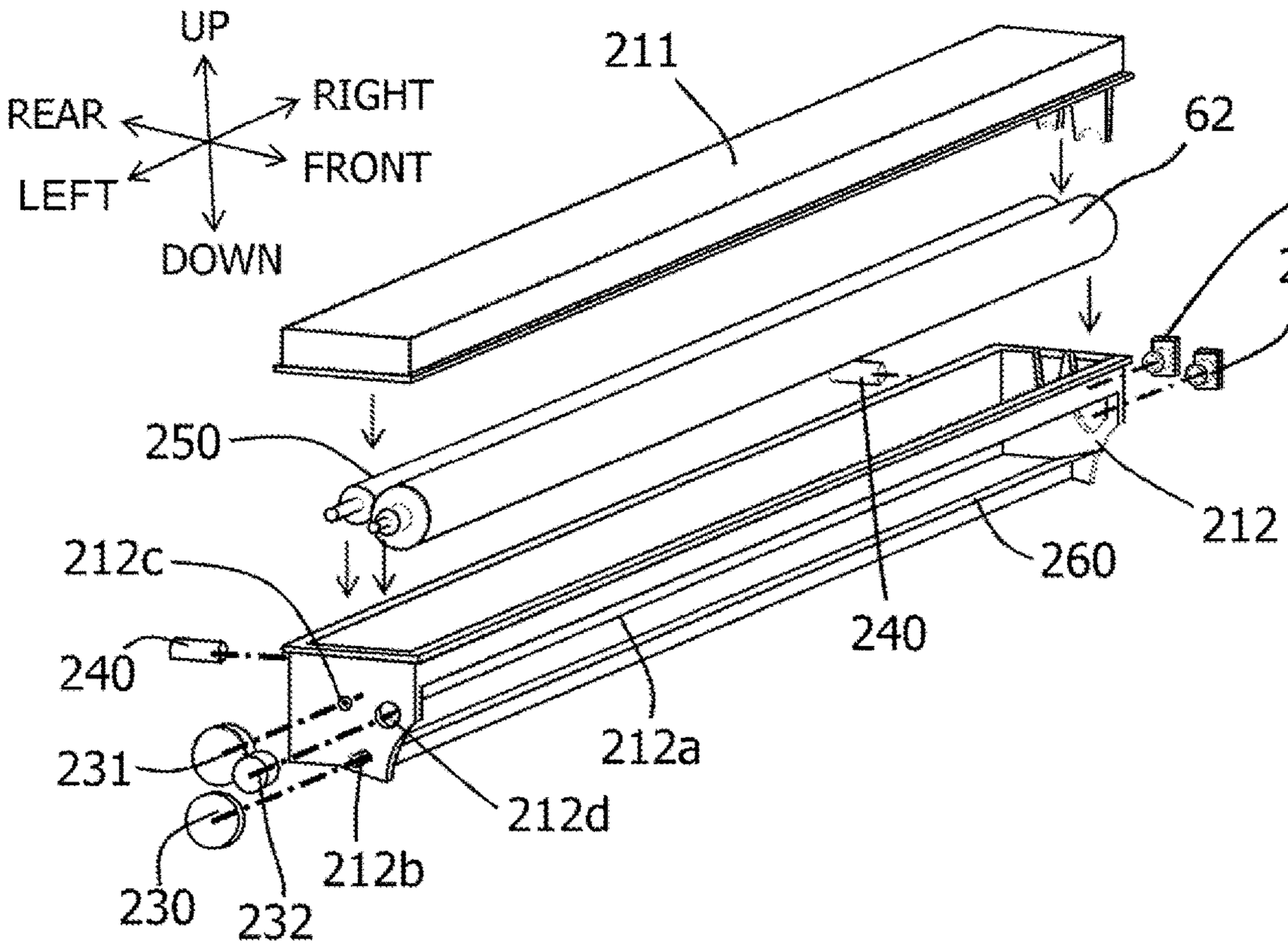


FIG.47B

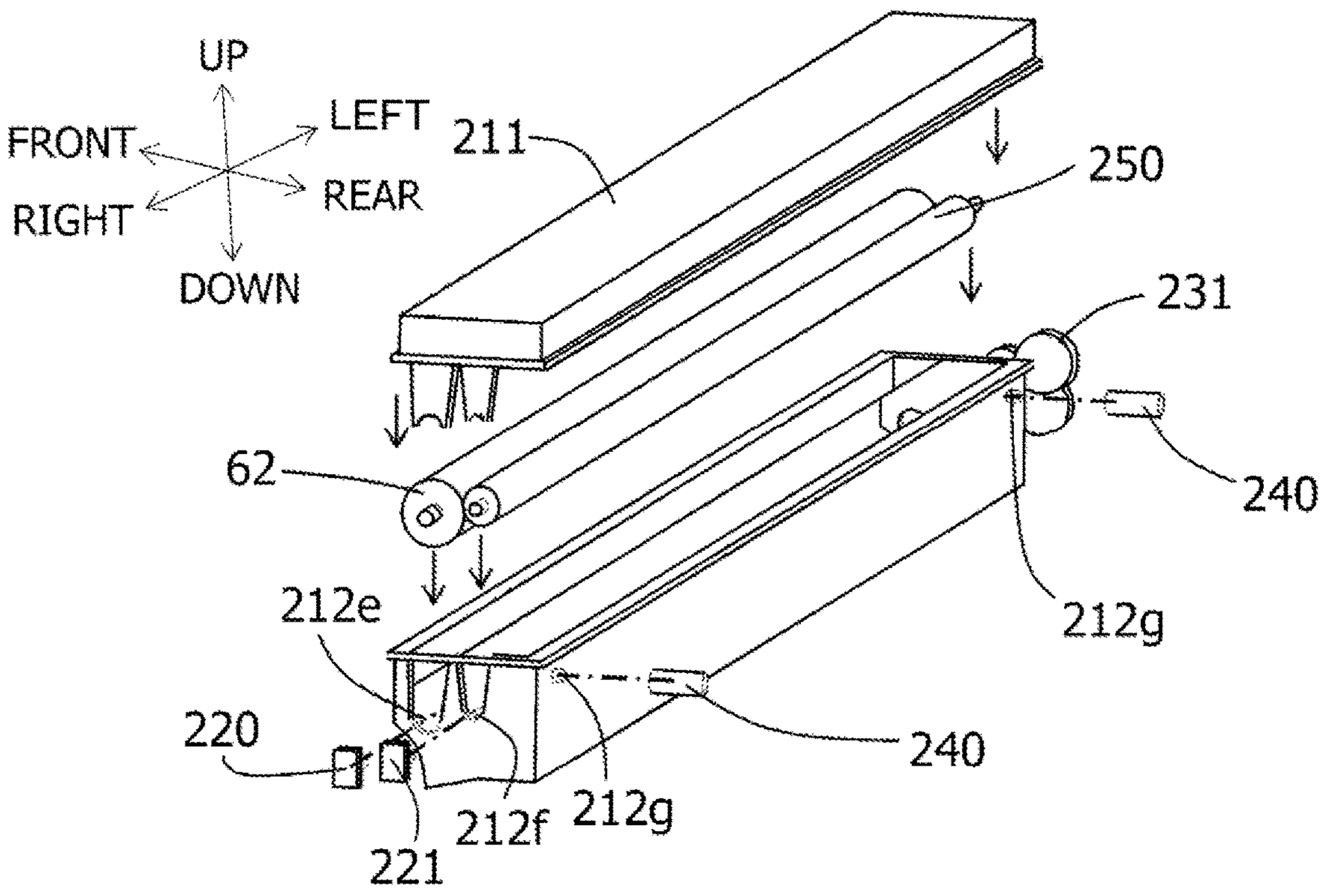


FIG. 48

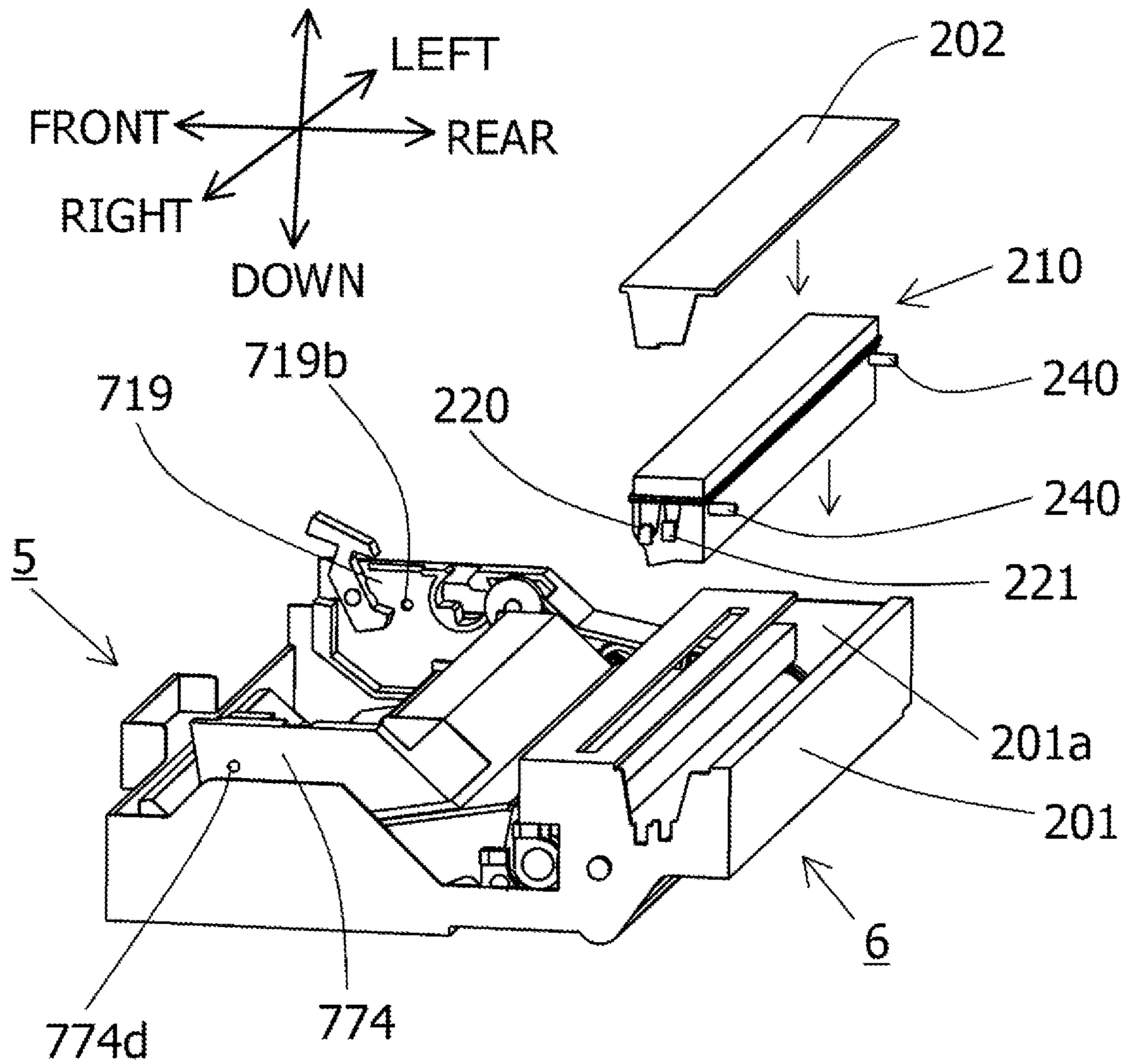

UP
LEFT
FRONT
REAR
RIGHT
DOWN
202
210
719b
719
220
240
240
5
221
201a
201
6
774d
774

FIG. 49

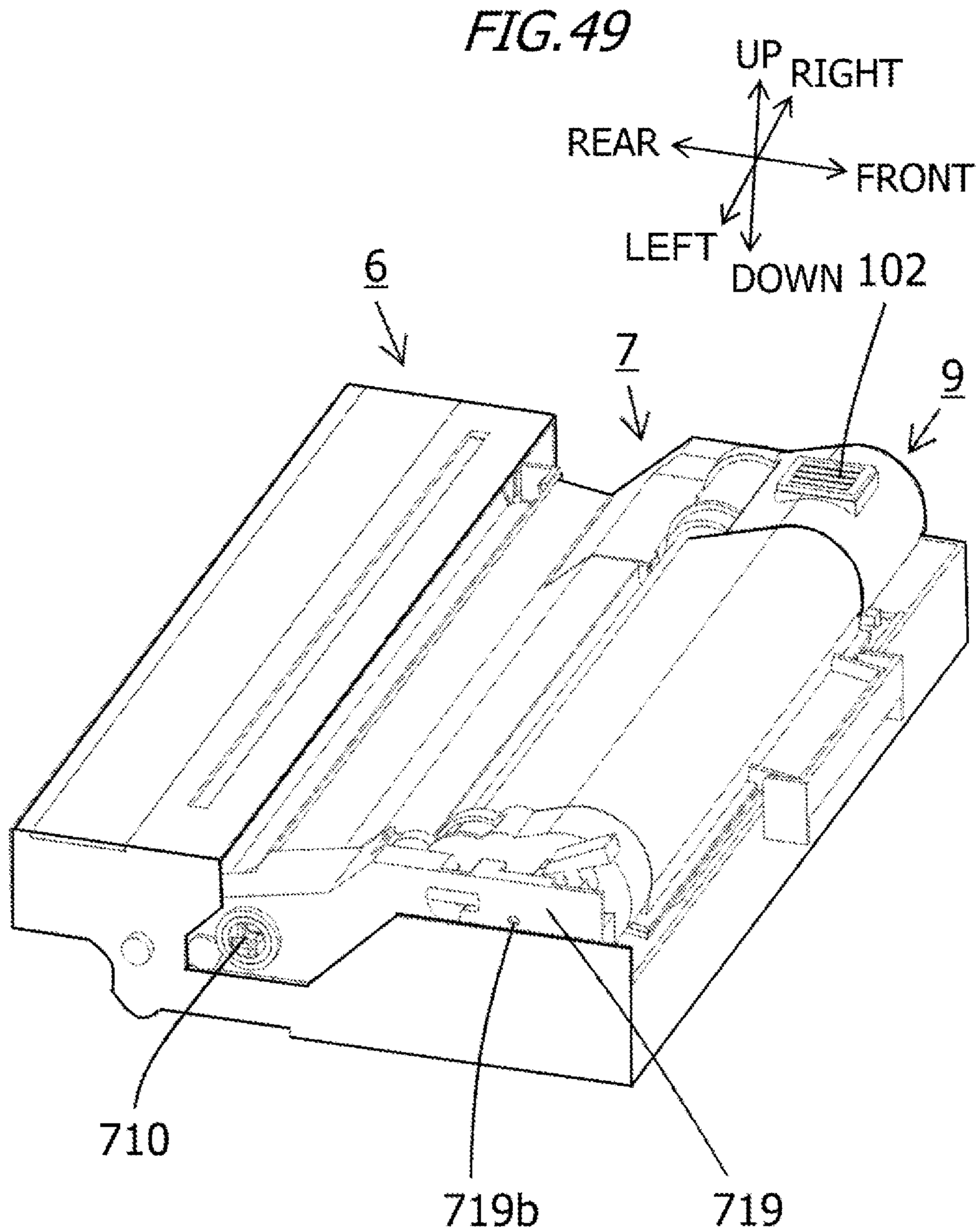


FIG.50

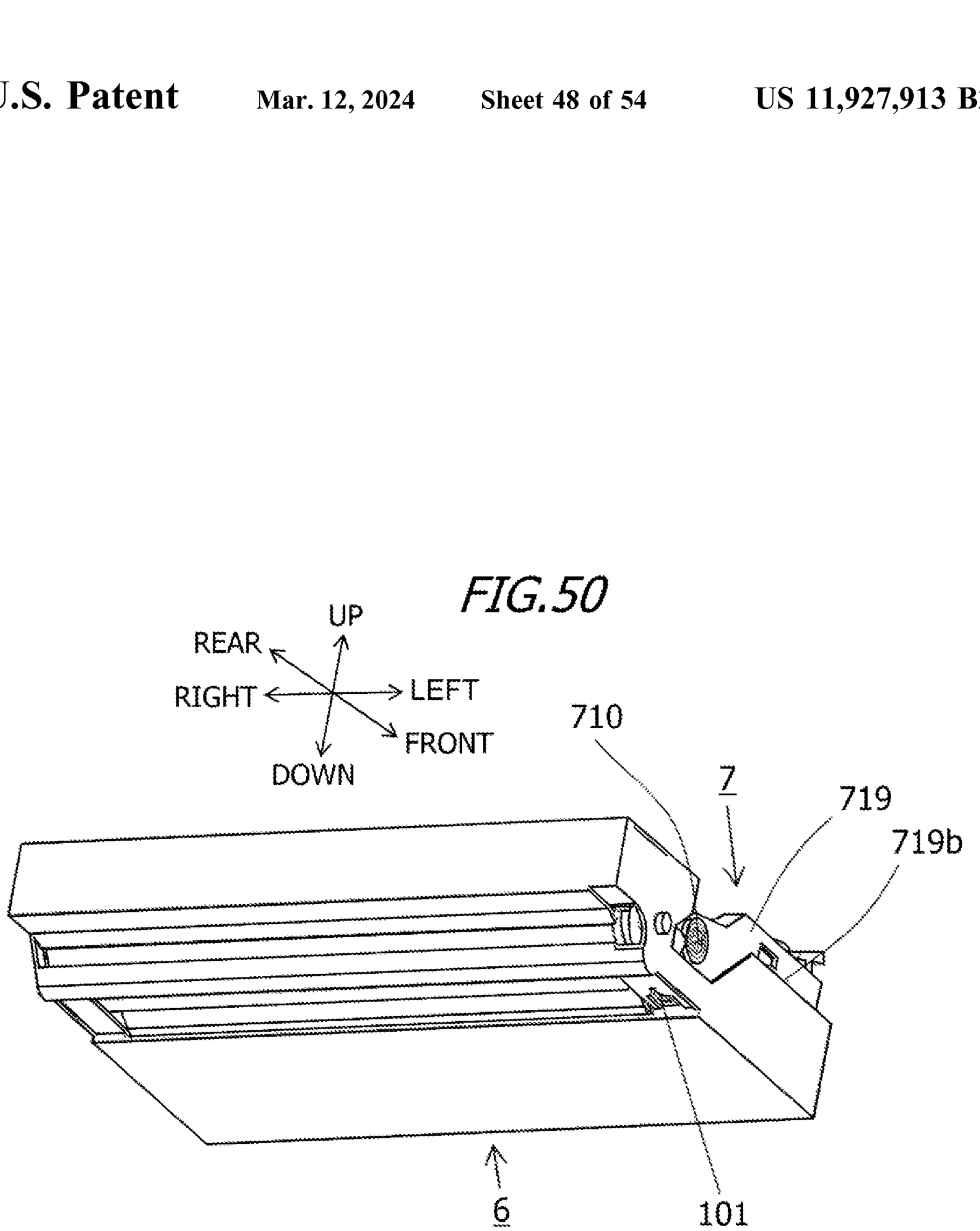


FIG.51

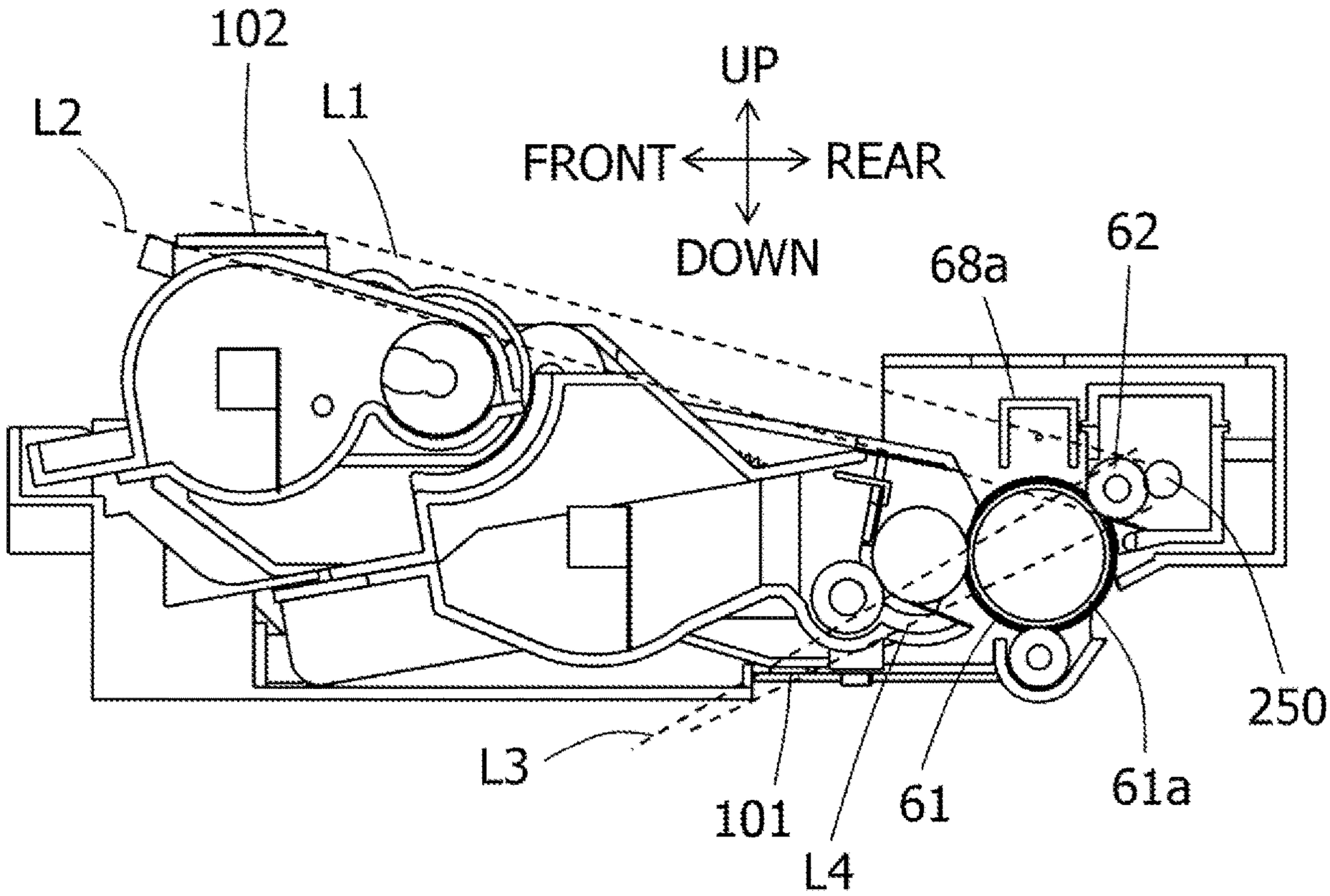


FIG.52

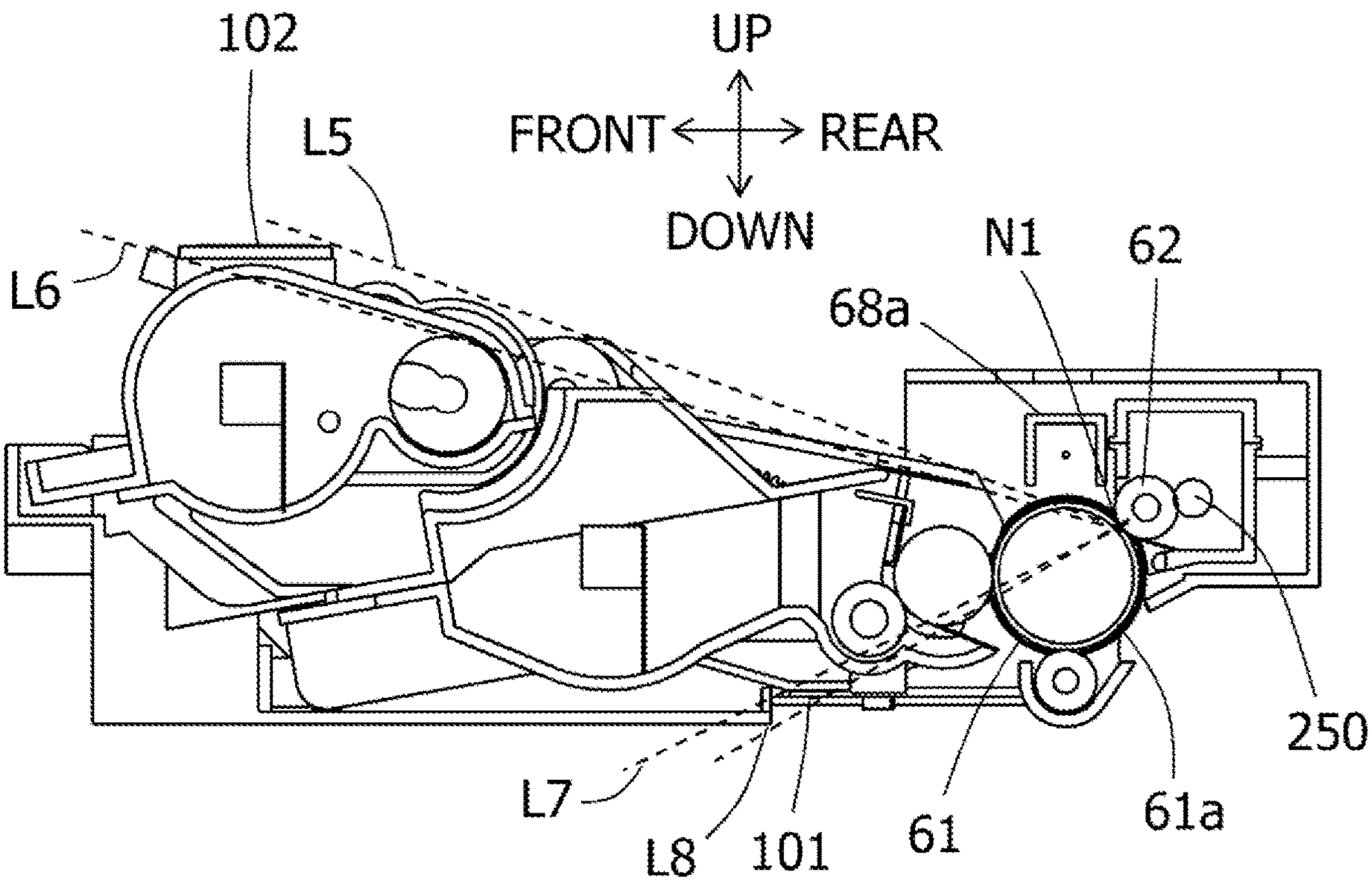


FIG.53

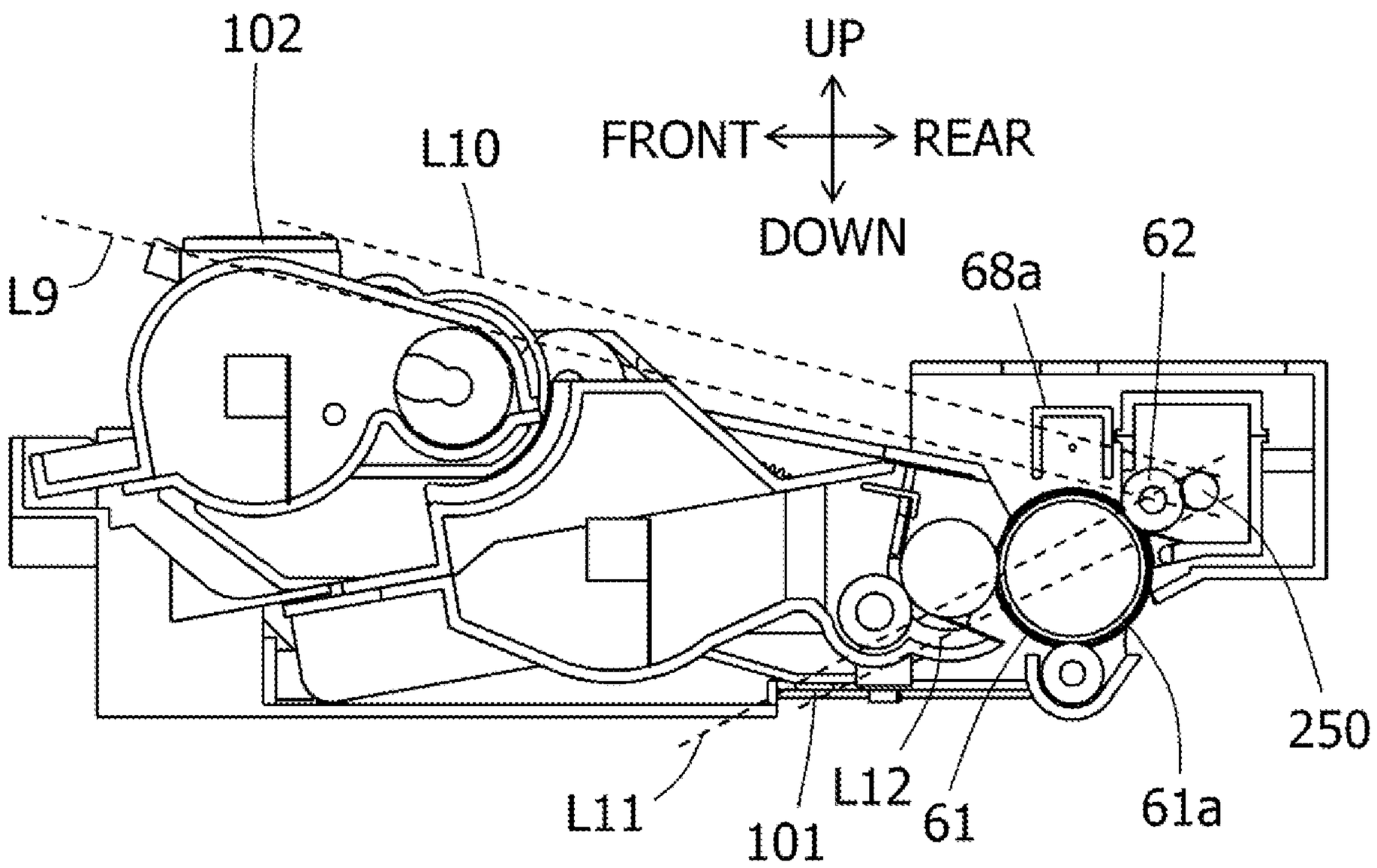


FIG.54

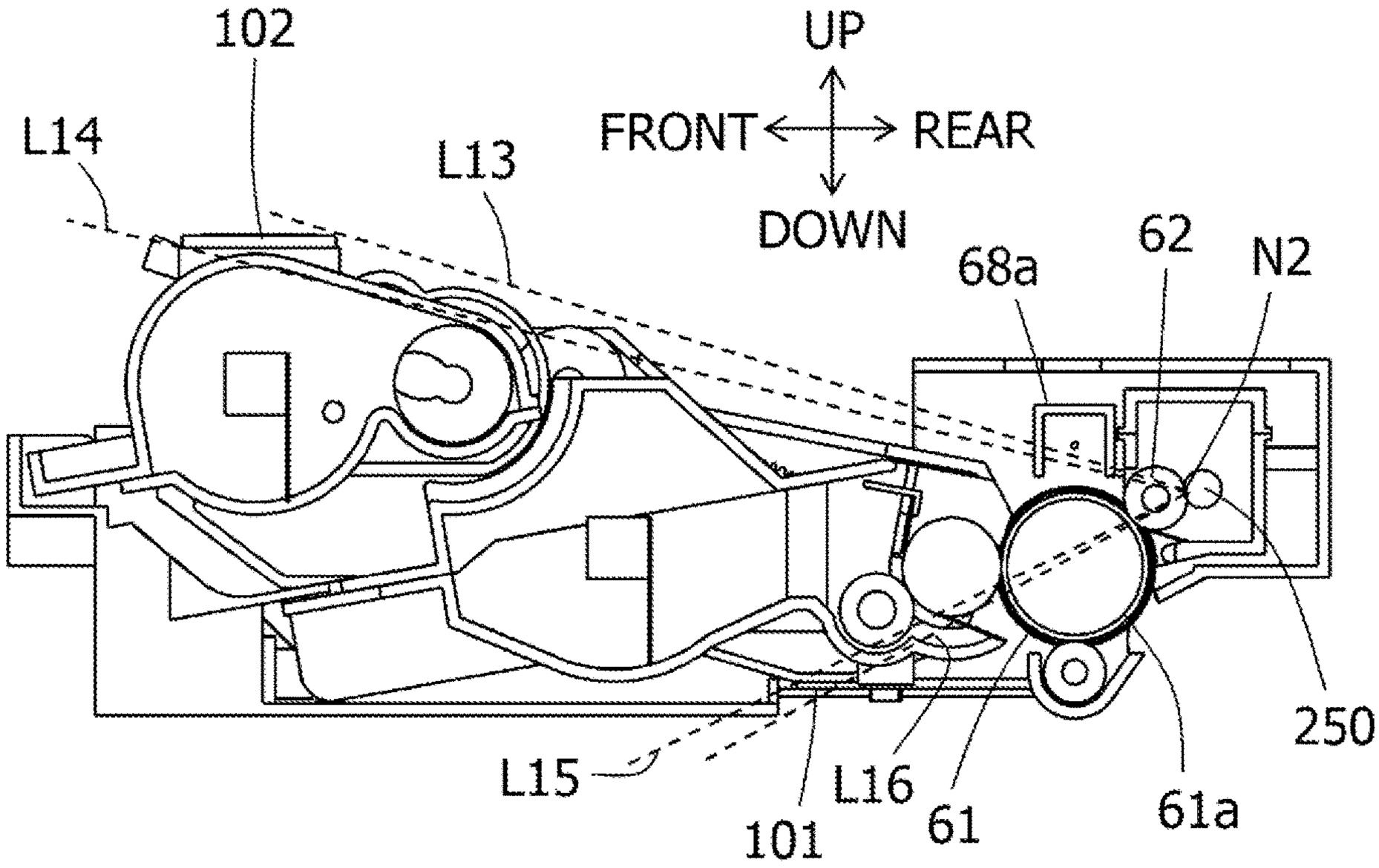


FIG.55

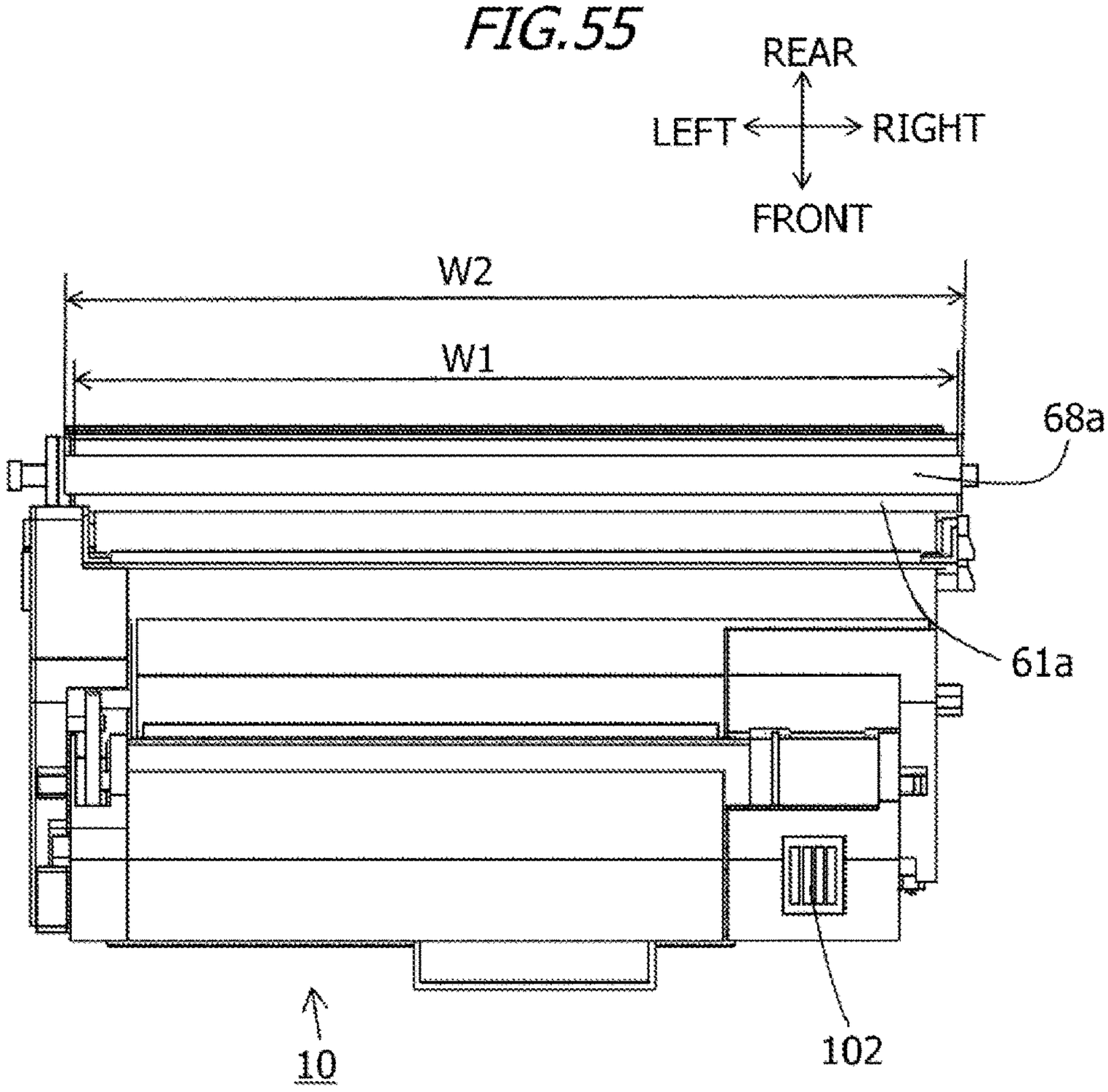

REAR
LEFT
RIGHT
FRONT
W2
W1
68a
61a
10
102

FIG.56

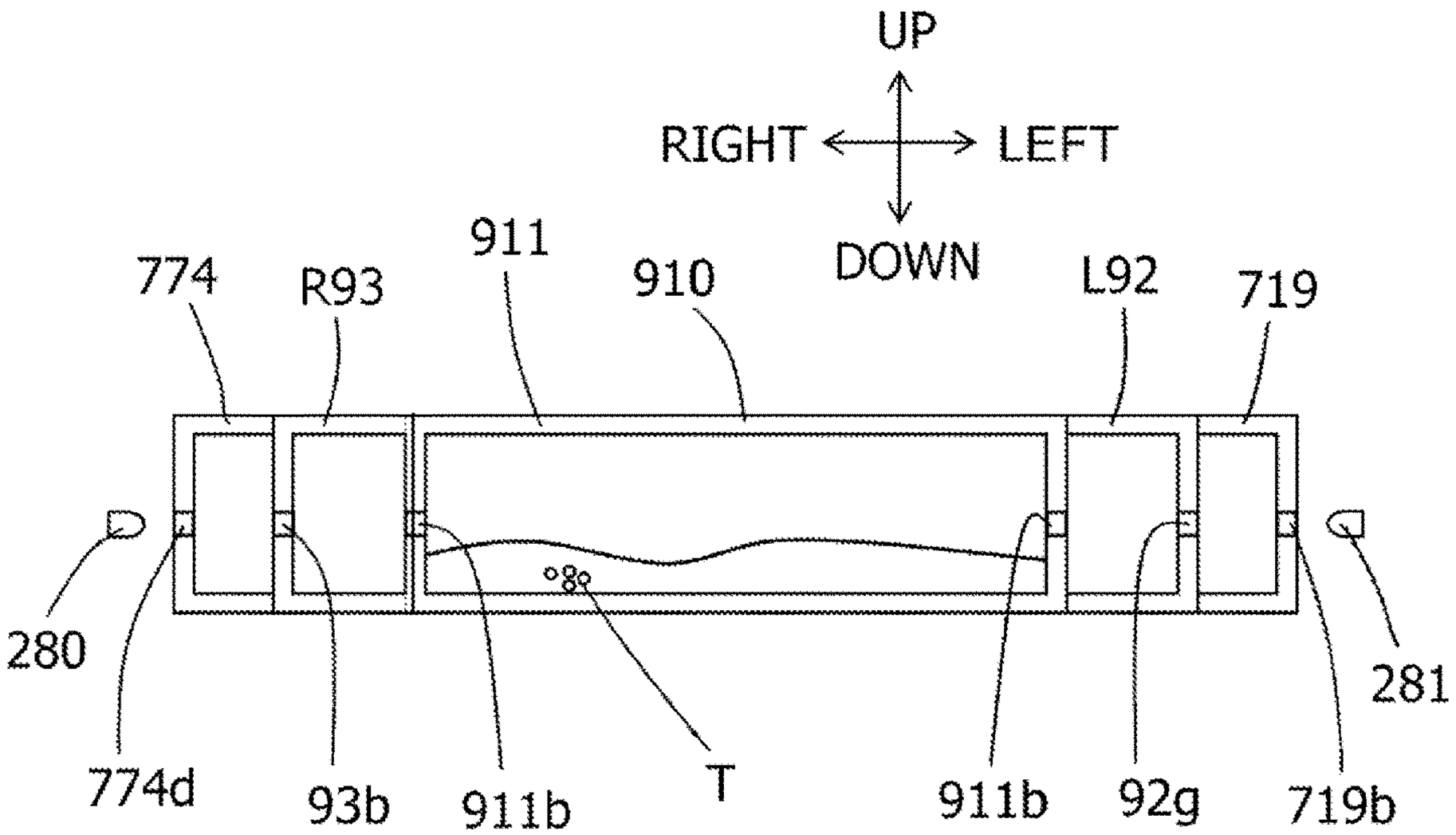
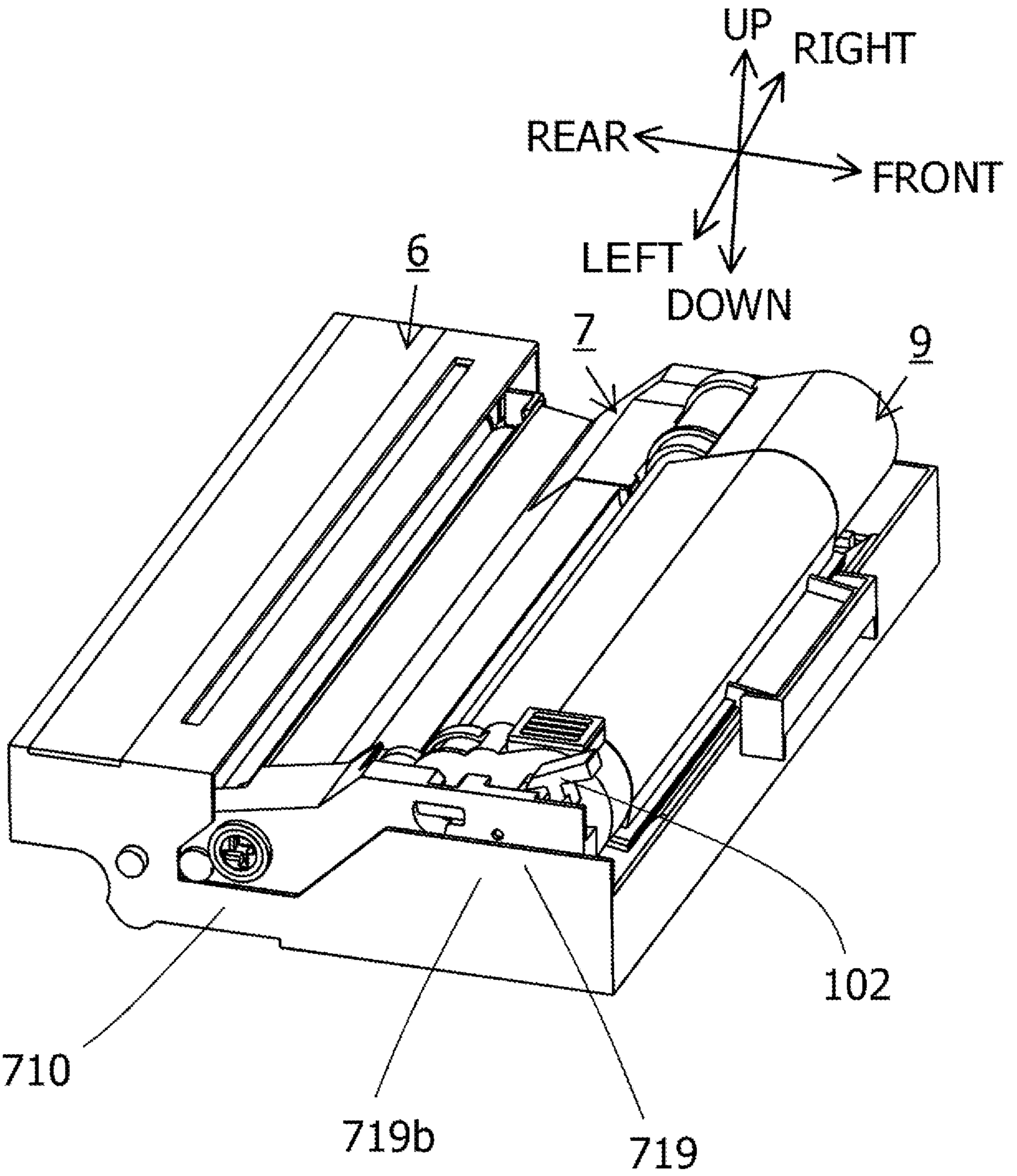

UP
RIGHT
LEFT
DOWN
774
R93
911
910
L92
719
280
281
774d
93b
911b
T
911b
92g
719b

FIG.57



CARTRIDGE UNIT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a cartridge unit.

Description of the Related Art

In laser beam printers and copiers used as electrophotographic image forming apparatuses, a toner image is formed on a photosensitive drum and the toner image is transferred to a sheet serving as a recording material to form an image on the recording material.

In laser beam printers, in order to facilitate maintenance, a method in which some parts of an image forming apparatus are provided in a cartridge and the cartridge is taken out of a main body of the apparatus to perform maintenance or replacement is widely adopted.

Japanese Patent Application Publication No. 2018-10243 discloses a cartridge unit having a photosensitive member unit having a photosensitive drum, a developing unit having a developing roller, and a toner cartridge for accommodating toner, in which the developing unit and the toner cartridge are attachable to and detachable from the photosensitive member unit.

The toner cartridge in which the toner is accommodated is detachably provided in a process cartridge having the developing unit and the photosensitive member unit. The cartridge unit is configured by integrating the process cartridge and the toner cartridge. On the other hand, a cartridge unit may include a storage member for storing information. An object of the present invention is to appropriately dispose a storage member in a case in which a toner cartridge includes the storage member.

SUMMARY OF THE INVENTION

In order to achieve the object described above, a cartridge unit including:

a first unit which includes a photosensitive drum, a developing roller, a first supporting portion, and a second supporting portion; and

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first supported portion supported by the first supporting portion, a second supported portion supported by the second supporting portion, and a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed,

wherein the second unit is configured to rotate from a first position to a second position in a state in which the first supported portion is supported by the first supporting portion and the second supported portion is supported by the second supporting portion so that the second unit is positioned with respect to the first unit,

the second unit rotate from the first position to the second position such that the first supported portion and the second supported portion are rotation centers of the second unit, and

a normal direction of the first contact arrangement surface faces toward a direction in which the first memory contact is exposed, the normal direction of the first contact arrangement surface faces toward a direction opposite to a direction in which the second unit is directed from the first position to the second position.

In order to achieve the object described above, a cartridge unit which is attachable to and detachable from an apparatus main body of an image forming apparatus, the apparatus main body including a positioning portion and a rotation restricting portion, the cartridge unit including:

a first unit which includes a photosensitive drum and a developing roller;

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed;

a positioned portion which comes into contact with the positioning portion; and

a rotation restricted portion which comes into contact with the rotation restricting portion and restricts rotation around the positioned portion,

wherein the first contact arrangement surface faces toward a direction opposite to a direction in which the rotation restricted portion is pressed against the rotation restricting portion.

Further features of the present invention will become apparent from the following description of exemplary embodiments (with reference to the attached drawings).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross-sectional view of an image forming apparatus including a cartridge unit of a first embodiment.

FIG. **2** is a cross-sectional view of a developing unit of the first embodiment.

FIG. **3** is a perspective view of the developing unit of the first embodiment.

FIG. **4** is an exploded perspective view of the developing unit of the first embodiment.

FIG. **5** is a cross-sectional view of a process cartridge of the first embodiment.

FIG. **6** is a top view of the developing unit of the first embodiment.

FIG. **7** is a perspective view of the process cartridge of the first embodiment.

FIG. **8** is a partial perspective view of a photosensitive member unit of the first embodiment.

FIG. **9** is a perspective view of the developing unit and the photosensitive member unit of the first embodiment.

FIG. **10** is a top view showing an arrangement relationship between the photosensitive member unit and the developing unit of the first embodiment.

FIG. **11** is a perspective view of the developing unit of the first embodiment from below.

FIG. **12** is an exploded perspective view of a toner cartridge of the first embodiment.

FIG. **13** is a perspective view of the toner cartridge of the first embodiment from below.

FIG. **14** is a cross-sectional view of the toner cartridge of the first embodiment.

FIG. **15**A is a perspective view of the toner cartridge and the process cartridge of the first embodiment.

FIG. **15**B is a perspective view of the toner cartridge and the process cartridge of the first embodiment.

FIG. **15**C is a perspective view of the toner cartridge and the process cartridge of the first embodiment.

FIGS. **16**A and **16**B are diagrams showing opening and closing operations of a receiving side shutter of the developing unit of the first embodiment.

FIGS. **17**A and **17**B are diagrams showing opening and closing operations of a discharge side shutter of the toner cartridge of the first embodiment.

FIGS. **18**A to **18**C are diagrams showing an operation of a lift mechanism of the first embodiment.

FIGS. **19**A to **19**C are diagrams showing an operation of the lift mechanism of the first embodiment.

FIG. **20** is a perspective view of the cartridge unit of the first embodiment.

FIG. **21** is a perspective view of the cartridge unit of the first embodiment.

FIG. **22** is a side view of the cartridge unit of the first embodiment.

FIGS. **23**A to **23**D are schematic diagrams showing the same direction and an opposite direction in the present invention.

FIG. **24** is a perspective view of the cartridge unit of the first embodiment.

FIG. **25** is a side view of the cartridge unit of the first embodiment.

FIG. **26** is a perspective view of a cartridge unit of a second embodiment.

FIG. **27** is a perspective view of the cartridge unit of the second embodiment.

FIG. **28** is a perspective view of a cartridge unit of a third embodiment.

FIG. **29** is a perspective view of the cartridge unit of the third embodiment and a first main body memory contact.

FIG. **30** is a perspective view of a cartridge unit of a fourth embodiment.

FIG. **31** is a front view of the cartridge unit of the fourth embodiment in an attaching direction.

FIG. **32** is a perspective view of the cartridge unit of the fourth embodiment attached to an apparatus main body.

FIG. **33** is a perspective view of the cartridge unit of the fourth embodiment and the first main body memory contact.

FIG. **34** is a perspective view of a cartridge unit of a fifth embodiment.

FIG. **35** is a perspective view of the cartridge unit of the fifth embodiment attached to the apparatus main body.

FIG. **36** is a cross-sectional view of the surroundings of a first memory tag of the fifth embodiment.

FIG. **37** is a perspective view of a toner cartridge of a sixth embodiment.

FIG. **38** is a perspective view of a cartridge unit of the sixth embodiment.

FIG. **39** is a cross-sectional view of the cartridge unit of the sixth embodiment.

FIG. **40** is a side view of the cartridge unit of the sixth embodiment.

FIG. **41** is a perspective view of a toner cartridge of a seventh embodiment.

FIG. **42** is a perspective view of a cartridge unit of the seventh embodiment.

FIG. **43** is a cross-sectional view of the cartridge unit of the seventh embodiment.

FIG. **44** is a perspective view of a cartridge unit of an eighth embodiment.

FIG. **45** is a cross-sectional view of a cartridge unit of a ninth embodiment.

FIGS. **46**A and **46**B are perspective views of a waste toner unit of the ninth embodiment.

FIGS. **47**A and **47**B are exploded perspective views of the waste toner unit of the ninth embodiment.

FIG. **48** is an exploded perspective view of a process cartridge of the ninth embodiment.

FIG. **49** is a perspective view of the cartridge unit of the ninth embodiment.

FIG. **50** is a perspective view of the cartridge unit of the ninth embodiment.

FIG. **51** is a cross-sectional view of the cartridge unit of the ninth embodiment.

FIG. **52** is a cross-sectional view of the cartridge unit of the ninth embodiment.

FIG. **53** is a cross-sectional view of the cartridge unit of the ninth embodiment.

FIG. **54** is a cross-sectional view of the cartridge unit of the ninth embodiment.

FIG. **55** is a top view of the cartridge unit of the ninth embodiment.

FIG. **56** is a schematic cross-sectional view of the cartridge unit of the ninth embodiment.

FIG. **57** is a perspective view of a cartridge unit of a tenth embodiment.

DESCRIPTION OF THE EMBODIMENTS

Embodiments of the present invention will now be described with reference to the drawings. Dimensions, materials, shapes of the components and the relative positions thereof described in the embodiments may be appropriately changed depending on the configuration of an apparatus to which the present invention is applied, and on various conditions, and are not intended to limit the scope of the invention to the following embodiments.

First Embodiment

A first embodiment of the present invention will be described in detail with reference to the figures as appropriate.

In the following description, directions are defined with a user who uses an image forming apparatus **1** set as a reference. That is, a front face side of the image forming apparatus **1** is defined as "front", a rear face side thereof is defined as "rear", an upper surface (top surface) side thereof is defined as "up", and a lower surface (bottom surface) side is thereof is defined as "down". Further, a left side of the image forming apparatus **1** when viewed from the front side is defined as "left", and a right side thereof is defined as "right".

Directions of a process cartridge **5** and a toner cartridge **9** are also defined in the same manner as in the image forming apparatus **1** assuming that they have the same postures as when they are attached to the image forming apparatus **1**. The directions in the figures are defined by arrows shown in the figures. A front to rear direction, an up and down direction, and a left to right direction indicated by these arrows are directions orthogonal to each other. These directions indicate fixed directions in all figures. The up and down direction is parallel to a vertical direction, and the left to right direction and the front to rear direction are parallel to a horizontal direction.

Also, the left to right direction is parallel to a rotational axis direction of a photosensitive drum **61** and a rotational axis direction of a developing roller **71**. Further, a developing unit **7** attached to and integrated with a photosensitive member unit **6** is referred to as the process cartridge **5**. An insertion direction (attaching direction) S**1** and a detaching

direction S2 when the process cartridge **5** is attached to an apparatus main body **2** are parallel to the front to rear direction and orthogonal to the left to right direction and the up and down direction.

In addition, the process cartridge **5** that is a first unit is provided with a detachable toner cartridge **9** that is a second unit for supplying toner to the developing unit **7**. The process cartridge **5** to which the toner cartridge **9** is attached and integrated is referred to as a cartridge unit **10**.

Overall Configuration of Image Forming Apparatus

FIG. **1** is a cross-sectional view of the image forming apparatus **1** to which the cartridge unit **10** is attached, and a cross-section thereof is parallel to the up and down direction and the front to rear direction. As shown in FIG. **1**, the image forming apparatus **1** mainly includes a paper feeding portion **3** for supplying paper S into an apparatus main body **2**, an exposure apparatus **4**, the cartridge unit **10** which transfers a toner image onto the paper S, and a fixing apparatus **8** which heat-fixes the toner image transferred onto the paper S.

The paper feeding portion **3** is provided in a lower part inside the apparatus main body **2** and mainly includes a paper feed tray **31** and a paper feeding mechanism **32**. The paper S accommodated in the paper feed tray **31** is supplied toward the cartridge unit **10** (between the photosensitive drum **61** and a transfer roller **63**) by the paper feeding mechanism **32**.

The exposure apparatus **4** is disposed in an upper part inside the apparatus main body **2** and includes a laser emitting unit (not shown), a polygon mirror, a lens, a reflecting mirror, etc., which have no reference numerals. In this exposure apparatus **4**, a laser beam based on image data which is emitted from the laser emitting unit is scanned at a high speed on a surface of the photosensitive drum **61** to expose the surface of the photosensitive drum **61**.

The cartridge unit **10** is attachable to and detachable from the apparatus main body **2** and is disposed below the exposure apparatus **4**. The cartridge unit **10** is inserted from an opening, which is formed in the apparatus main body **2** when a door (an opening and closing member) **21** of the apparatus main body **2** is opened (shown by a two-dot chain line in FIG. **1**), into an accommodating portion **23** of the apparatus main body **2** in an insertion direction S**1**, and the cartridge unit **10** is attached to the apparatus main body **2**. When the cartridge unit **10** is detached from the apparatus main body **2**, the cartridge unit **10** is moved and taken out in a detaching direction S**2**.

The cartridge unit **10** has the process cartridge **5** and the toner cartridge **9**. The cartridge unit **10** is configured to be attachable to and detachable from the apparatus main body **2** in a state in which the toner cartridge **9** is attached to the process cartridge **5**. The process cartridge **5** mainly includes the photosensitive member unit **6** and the developing unit **7**. The photosensitive member unit **6** mainly includes the photosensitive drum **61**, a corona charging device **68**, an exposure portion **69**, a recovery roller **62**, and the transfer roller **63**. The developing unit **7** is configured to be detachably attached to the photosensitive member unit **6**. Alternatively, the developing unit **7** may be integrated with the photosensitive member unit **6** to be replaceable. The developing unit **7** mainly includes the developing roller **71**, a supply roller **72**, a layer thickness regulating blade **73**, a toner accommodating portion (a developer accommodating portion) **74** which accommodates toner (developer), and a first agitator **75**A provided in the toner accommodating portion **74**. Also, the developing unit **7** may be configured to be separable from the photosensitive member unit **6**. In that case, the toner cartridge **9** can be attached to and detached from the developing unit **7** in a state in which the photosensitive member unit **6** and the developing unit **7** are coupled to each other.

Image Forming Process

Next, an image forming process using the process cartridge **5** will be described. FIG. **5** is a cross-sectional view of the process cartridge **5**. The photosensitive drum **61** is rotationally driven during the execution of the image forming process. First, the surface of the photosensitive drum **61** is uniformly charged by the corona charging device **68**, and then exposed with the laser beam corresponding to the image data emitted from the exposure apparatus **4** (see FIG. **1**), whereby an electrostatic latent image corresponding to the image data is formed on the photosensitive drum **61**.

On the other hand, the toner in the toner accommodating portion **74** is agitated by the first agitator **75**A and then supplied to the developing roller **71** via the supply roller **72**. Then, the toner supplied to the developing roller **71** enters a position between the developing roller **71** and the layer thickness regulating blade **73** and is carried on the developing roller **71** as a thin layer having a constant thickness.

The toner carried on the developing roller **71** is supplied to the electrostatic latent image formed on the photosensitive drum **61**. Thus, the toner adheres to the electrostatic latent image and is visualized, and a toner image is formed on the photosensitive drum **61**. After that, the paper S is conveyed between the photosensitive drum **61** and the transfer roller **63**, and the toner image on the photosensitive drum **61** is transferred onto the paper S.

As shown in FIG. **1**, the fixing apparatus **8** is disposed behind the process cartridge **5** and mainly includes a heat roller **82** and a pressure roller **81**. The paper S onto which the toner image is transferred passes through the fixing apparatus **8**, and at that time, the paper S is heated and pressurized between the heat roller **82** and the pressure roller **81**, and the toner image is fixed on the paper S. The paper S that has passed through the fixing apparatus **8** is discharged onto a paper ejection tray **22**.

The corona charging device **68** is a charging unit that charges the surface of the photosensitive drum **61** in a non-contact manner The exposure portion **69** includes a light emitting diode serving as a light source and a light guide serving as a light guide member and guides the light emitted from the light emitting diode with the light guide and irradiates the surface of the photosensitive drum **61** with the light. The current supplied to the light emitting diode is supplied from the apparatus main body **2**. The charge on the surface of the photosensitive drum **61** is removed by irradiation with light from the exposure portion **69**. Further, a predetermined voltage is applied to the recovery roller **62** from the apparatus main body **2**, and foreign matter such as paper dust and contaminants and toner adhering to the surface of the photosensitive drum **61** are collected.

Configuration of Process Cartridge

Next, each unit of the process cartridge **5** will be described. As described above, the process cartridge **5** includes the photosensitive member unit **6** and the developing unit **7**.

Configuration of Developing Unit

First, a configuration of the developing unit **7** will be described. FIG. **2** is a cross-sectional view of the developing unit **7** and is a cross-sectional view along line A-A in FIG. **3**. FIG. **3** is a perspective view of the developing unit **7**. Further, the cross-section A-A in FIG. **3** is parallel to the up and down direction and the front to rear direction. FIG. **4** is an exploded perspective view of the developing unit **7**. FIG.

6 is a top view of the developing unit 7 and shows a state in which a top surface of a housing 700 is removed for convenience of explanation. FIG. 11 is a perspective view of the developing unit 7 from below. In the developing unit 7, as shown in FIG. 2, the developing roller 71 is rotatably supported on a rear side of the housing 700.

As shown in FIGS. 4 and 6, both ends of the developing roller 71, the supply roller 72, and the first agitator (first stirring member) 75A are rotatably supported by each of a left side wall 704 and a right side wall 705 of the housing 700. Also, a developing coupling 710, a developing roller gear 711, a supply roller gear 712, a first agitator gear 713, and idle gears 715A and 715B are provided on a left side of the left side wall 704 of the housing 700. The developing roller gear 711 is fixed to an end portion of the developing roller 71, and the supply roller gear 712 is fixed to the end of the supply roller 72. Further, the first agitator gear 713 is fixed to an end portion of an agitating rod 78A (see FIG. 5) of the first agitator 75A.

In addition, the developing unit 7 can be equipped with the toner cartridge 9 for supplying toner and is provided with a toner receiving portion 770 for receiving the toner supplied by the toner cartridge 9. Further, the developing unit 7 is also provided with a lift mechanism 760 for holding and lifting up the toner cartridge 9.

As shown in FIG. 3, the developing unit 7 is provided with an electrical contact 720A serving as a first electrical contact that is electrically connected to the developing roller 71 and is supplied with a voltage applied to the developing roller 71. Further, the developing unit 7 is provided with an electrical contact 720B serving as a second electrical contact that is electrically connected to the supply roller 72 and is supplied with the voltage applied to the supply roller 72. These electrical contacts come into contact with power supply contacts (not shown) provided on the apparatus main body 2, whereby power is supplied to the developing roller 71 and the supply roller 72.

Next, a drive configuration of the developing unit 7 will be described with reference to FIG. 4. A developing drive transmission member (not shown) provided in the apparatus main body 2 moves rightward in conjunction with an operation of closing the door 21 (FIG. 1) provided in the apparatus main body 2 toward a position for engaging with the developing coupling 710. On the other hand, the development drive transmission member moves leftward in conjunction with an operation of opening the door 21 (FIG. 1) of the apparatus main body 2 toward a position for releasing the engagement with the developing coupling 710.

When the apparatus main body 2 operates after the door 21 (FIG. 1) of the apparatus main body 2 is closed, a driving force is transmitted (input) from the developing drive transmission member to the developing coupling 710 serving as a driving force receiving member. Next, the developing roller 71 becomes rotatable from a gear provided on a circumferential surface of the developing coupling 710 via the developing roller gear 711, and the supply roller 72 becomes rotatable via the supply roller gear 712. The developing drive transmission member is configured to allow a position shift of the developing coupling 710 within a predetermined range and transmit a driving force to the developing coupling 710. A side holder 719 attached to the housing 700 restricts movement of the developing coupling 710, the developing roller gear 711, and the supply roller gear 712 in a rotational axis direction of the developing roller 71.

As shown in FIG. 5, the developing unit 7 has the first agitator 75A, and the first agitator 75A agitates the toner inside the toner accommodating portion 74. The first agitator 75A includes the agitating rod 78A and an agitating sheet 79A. Further, the first agitator 75A is configured to be rotatable by receiving a driving force from the developing coupling 710 via the idle gear 715A using the first agitator gear 713 (see FIG. 6). The toner in the vicinity of the first agitator 75A inside the toner accommodating portion 74 is agitated by the first agitator 75A, then supplied to the supply roller 72 side, and further supplied to the developing roller 71 by the supply roller 72.

Configuration of Photosensitive Member Unit and Support of Developing Unit

Next, a detailed configuration of the photosensitive member unit 6 will be described. FIG. 7 is a perspective view of the process cartridge 5. FIG. 8 is a partial perspective view of the photosensitive member unit 6. FIG. 9 is a perspective view of the developing unit 7 and the photosensitive member unit 6. FIG. 10 is a top view showing an arrangement relationship of the photosensitive member unit 6, the developing unit 7, and the developing roller 71 in the left to right direction.

As shown in FIG. 9, the photosensitive member unit 6 mainly includes a frame 610 having a pair of left and right side walls 611 and 612, and the photosensitive drum 61 rotatably supported on a rear side of the frame 610. The photosensitive drum 61 is configured by applying a photosensitive layer to an outer surface of an aluminum drum tube. In front of the frame 610, an attaching portion 615 to which the developing unit 7 can be attached, a gripping portion 617 for the user to grip the photosensitive member unit 6, and pressing members 640 for pressing the developing unit 7 are provided. In addition, as shown in FIG. 7, the toner accommodating portion 74 of the developing unit 7 attached to the attaching portion 615 is disposed between the left side wall 611 and the right side wall 612 in the left to right direction.

As shown in FIGS. 7 and 9, on the left side wall 611 and the right side wall 612 of the frame 610, a receiving portion 641 for receiving rotating bearing members 746A and 746B of the developing roller 71 is formed in front of the photosensitive drum 61. The receiving portion 641 is a substantially U-shaped depressed portion whose front side is open, and a rotation shaft of the developing roller 71 is inserted into the receiving portion 641. The developing unit 7 is supported on the photosensitive member unit 6 by the receiving portion 641.

Further, as shown in FIG. 10, protruding portions 643 that protrude upward are provided at both end portions of a bottom surface 613 of the frame 610 in the left to right direction. The protruding portions 643 movably support the developing unit 7 by coming into contact with a boss 718 provided at a bottom portion of the housing 700 of the developing unit 7, which is shown in FIG. 11. In addition, in the configuration of the present embodiment, as shown in FIG. 7, a pressing member 650 for restricting detachment of the developing unit 7 is provided in a state in which the developing unit 7 is attached to the photosensitive member unit 6.

As shown in FIG. 9, the pressing members 640 are provided in front of the frame 610 and at both end portions of the frame 610 in the left to right direction and biased in a direction from the front toward the rear due to a compression spring 640A (FIG. 10) serving as a biasing member. For this reason, the pressing members 640 press the boss 718 (FIG. 11) provided in the housing 700 of the developing unit 7 due to a biasing force of the compression spring 640A (FIG. 10). By pressing the developing unit 7 with the

pressing members **640**, the developing roller **71** is biased toward the photosensitive drum **61**.

Further, as shown in FIG. **8**, a photosensitive member gear (first gear) **65** and a transfer gear (second gear) **66** are fixed to a left end portion of the photosensitive drum **61** and configured to rotate integrally with the photosensitive drum **61**. When the process cartridge **5** is attached to the apparatus main body **2**, a driving gear (not shown) of the apparatus main body **2** and the photosensitive member gear **65** engage with each other, and thus a driving force is transmitted to the photosensitive drum **61** and the transfer gear **66** to make them rotatable. The transfer gear **66** further engages with a transfer roller gear (third gear) **67** fixed to a left end portion of the transfer roller **63**, and the transfer roller **63** is also in a rotatable state.

Configuration of Toner Cartridge

Next, a configuration of the toner cartridge **9** will be described. FIG. **12** is an exploded perspective view of the toner cartridge **9**, and FIG. **13** is a perspective view of the toner cartridge **9** from below. Further, FIG. **14** is a cross-sectional view of the toner cartridge **9**.

As shown in FIG. **12**, the toner cartridge **9** mainly includes a container member **911**, a bottom member **912**, a T side holder L**92**, a T side holder R**93**, a discharge opening forming member **94**, a discharge side shutter **95**, a conveying screw **96**, and a second agitator **97**. Further, in order to transmit the drive, a conveying screw gear **980**, a T idle gear **981**, and a second agitator gear **982** are provided. The T side holder L**92** and the T side holder R**93** can also be a part of the toner container **910**. In addition, the T side holder L**92**, the T side holder R**93**, and the toner container **910** can be collectively referred to as a frame of the toner cartridge **9**. The T side holder L**92**, the T side holder R**93**, and the toner container **910** may be integrally formed.

As shown in FIG. **13**, the toner container **910** is formed by the container member **911** and the bottom member **912**, and the toner is accommodated inside the toner container **910**. The discharge opening forming member **94** is provided at one end portion of the toner container **910** in a longitudinal direction thereof. The discharge opening forming member **94** has a discharge opening forming surface **94**C on an outer circumferential portion thereof, and a discharge opening **94**A for discharging toner to the outside is formed on the discharge opening forming surface **94**C.

As shown in FIG. **14**, the conveying screw **96** and the second agitator **97** are rotatably provided inside the toner container **910**. A driving force is transmitted to the conveying screw **96** and the second agitator **97** by the conveying screw gear **980** and the second agitator gear **982** provided outside the toner container **910** to make them rotate (see FIG. **12**). The second agitator **97** is configured of a second agitating rod **98** and a second agitating sheet **99**, similarly to the first agitator **75**A. The toner contained inside the toner container **910** is agitated and conveyed toward the conveying screw **96** by the second agitator **97**. Next, the toner is conveyed to the right toward the discharge opening **94**A shown in FIG. **13** by the conveying screw **96** and is discharged from the discharge opening **94**A.

As shown in FIG. **12**, the discharge side shutter **95** is rotatably provided inside the discharge opening forming member **94**. The discharge side shutter **95** is provided with a toner passing hole **95**A and a closing portion **95**B. In a case in which the discharge side shutter **95** rotates and a position of the toner passing hole **95**A and a position of the discharge opening **94**A coincide with each other, the toner can be discharged from the discharge opening **94**A. On the other hand, in a case in which the closing portion **95**B faces the discharge opening **94**A, the discharge of toner from the discharge opening **94**A is restricted to prevent the toner inside the toner container **910** from leaking at the time of conveying or the like.

Support of Toner Cartridge

Next, a support configuration of the toner cartridge **9** will be described. FIGS. **15**A to **15**C are perspective views of the toner cartridge **9** and the process cartridge **5**. FIG. **15**A shows a state before the toner cartridge **9** is attached to the process cartridge **5**. FIG. **15**B shows a state in which the toner cartridge **9** is being attached to the process cartridge **5**. FIG. **15**C shows a state in which the toner cartridge **9** has been attached to the process cartridge **5**.

As shown in FIGS. **15**A to **15**C, the toner cartridge **9** is attachable to and detachable from the developing unit **7**. The container member **911** of the toner cartridge **9** is provided with a handle portion **911**A as a gripping portion for the second unit. The T side holder L**92** and the T side holder R**93** are fixed to both end portions of the toner cartridge **9** in a longitudinal direction thereof. The T side holder L**92** and the T side holder R**93** each include a supported protrusion L**92**A and a supported protrusion R**93**A (supported portion) for being supported by the developing unit **7**. Further, the developing unit **7** is provided with a supporting portion L**730** and a supporting portion R**731** for supporting the supported protrusion L**92**A and the supported protrusion R**93**A.

As shown in FIG. **15**A, when the toner cartridge **9** is attached to the developing unit **7**, the toner cartridge **9** is moved in a direction of arrow S**3** while the handle portion **911**A is gripped from above with respect to the developing unit **7**. As shown in FIG. **15**B, the toner cartridge **9** moved in the direction of the arrow S**3** is in a state in which the supported protrusion L**92**A and the supported protrusion R**93**A are supported by the supporting portion L**730** and the supporting portion R**731**. From this state, the toner cartridge **9** is rotated in a direction of arrow R**3** with the supported protrusion L**92**A and the supported protrusion R**93**A serving as rotation centers. As a result, as shown in FIG. **15**C, attaching of the toner cartridge **9** on the process cartridge **5** is completed, and the cartridge unit **10** is formed. A rotational axis direction of the toner cartridge **9** is parallel to the longitudinal direction of the toner cartridge **9**.

Further, in a state in which the toner cartridge **9** has been attached to the process cartridge **5**, the conveying screw gear **980** of the toner cartridge **9** can engage with the idle gear **715**B of the developing unit **7**. As a result, the driving force of the developing unit **7** is transmitted to the toner cartridge **9**.

A life span of the toner cartridge **9** determined by an amount of toner stored in the toner cartridge **9** is set shorter than a life span of the process cartridge **5** determined by a life span of the photosensitive drum **61** and a life span of the developing roller **71**. Therefore, it is necessary to replace only the toner cartridge **9** that has reached the end of its life span separately from the process cartridge **5**. In this case, the toner cartridge **9** can be replaced by simply opening the door **21** (FIG. **1**) of the apparatus main body **2**, and the user can perform the replacement work without detaching the process cartridge **5** from the apparatus main body **2**.

Opening and Closing Operations of Receiving Side Shutter

Next, opening and closing operations of a receiving side shutter will be described. FIGS. **16**A and **16**B are diagrams showing the opening and closing operations of the receiving side shutter of the developing unit **7**, FIG. **16**A shows a state

in which the receiving side shutter is closed, and FIG. **16**B shows a state in which the receiving side shutter is open.

As shown in FIG. **4**, the toner receiving portion **770** of the developing unit **7** is configured of a toner receiving port **771**, a receiving side shutter seal **772**, a receiving side shutter **773**, a receiving port cover **774**, and a connecting seal **775** which are provided on an upper surface **700**A of the housing **700**. Hole portions **772**A, **773**A, **774**A, and **775**A are provided in the receiving side shutter seal **772**, the receiving side shutter **773**, the receiving port cover **774**, and the connecting seal **775**, respectively. In a state in which each position of the hole portion **772**A of the receiving side shutter seal **772**, the hole portion **774**A of the receiving port cover **774**, and the hole portion **775**A of the connecting seal **775** coincides with a position of the toner receiving port **771**, they are assembled with each other. Further, the receiving side shutter **773** is provided with a shielding portion **773**B in addition to the hole portion **773**A and is assembled in a state in which it can be slid. The toner receiving port **771** is opened and closed by sliding the shielding portion **773**B.

Here, opening and closing operations of the receiving side shutter **773** will be described with reference to FIGS. **16**A and **16**B. The opening and closing operations of the receiving side shutter **773** is performed in conjunction with the attaching operation and the detaching operation of the toner cartridge **9**. As shown in FIGS. **16**A and **16**B, a drive protrusion group **94**B is disposed on an outer circumferential surface of the discharge opening forming member **94** of the toner cartridge **9**. Further, a driven protrusion group **773**C is disposed in the receiving side shutter **773**.

As described above, in the process of attaching the toner cartridge **9**, a rotational operation of the toner cartridge **9** is performed to shift to a fully attached state. FIG. **16**A shows a state before the rotational operation of the toner cartridge **9** is performed in the process of attaching the toner cartridge **9**. In the state shown in FIG. **16**A, the shielding portion **773**B of the receiving side shutter **773** faces the toner receiving port **771** and the toner receiving port **771** is closed. In this case, the drive protrusion group **94**B and the driven protrusion group **773**C are in an engaged state.

FIG. **16**B shows the fully attached state after the toner cartridge **9** is rotated. In this case, since the rotational operation of the toner cartridge **9** is performed while the drive protrusion group **94**B and the driven protrusion group **773**C maintain their engagement, the receiving side shutter **773** slides in conjunction with the rotational operation of the toner cartridge **9**. Thus, the position of the hole portion **773**A of the receiving side shutter **773** and the position of the toner receiving port **771** coincide with each other to open the toner receiving port **771**. Similarly, when the toner cartridge **9** is detached from the developing unit **7**, the receiving side shutter **773** slides in conjunction with the rotational operation of the toner cartridge **9**, and the toner receiving port **771** is closed.

As described above, in the state in which the toner cartridge **9** is attached to the developing unit **7**, the toner receiving port **771** is in an open state, and the toner can be received inside the developing unit **7**. On the other hand, in the state in which the toner cartridge **9** is not attached to the developing unit **7**, the toner receiving port **771** is closed to prevent foreign matter from entering the developing unit **7** and the toner from leaking to the outside of the developing unit **7**.

Opening and Closing Operations of Shutter on Discharge Side

Next, opening and closing operations of the discharge side shutter **95** will be described. FIGS. **17**A and **17**B are diagrams showing the opening and closing operations of the discharge side shutter **95** of the toner cartridge **9**, FIG. **17**A shows a state in which the discharge side shutter **95** is closed, and FIG. **17**B shows a state in which the discharge side shutter **95** is open.

As described above, in the case in which the position of the discharge opening **94**A of the discharge opening forming member **94** shown in FIG. **12** and the position of the toner passing hole **95**A of the discharge side shutter **95** coincide with each other, the discharge opening **94**A is in an open state. Further, in the case in which the closing portion **95**B of the discharge side shutter **95** faces the discharge opening **94**A, the discharge opening **94**A is in a closed state. The opening and closing operations of the discharge side shutter **95** are also performed in conjunction with the rotational operation at the time of attaching and detaching the toner cartridge **9**, similar to the opening and closing operations of the receiving side shutter **773** described above.

As shown in FIGS. **17**A and **17**B, the discharge side shutter **95** is provided with a locked protrusion **95**C, and the locked protrusion **95**C is disposed inside the supported protrusions R**93**A in a radial direction thereof. Further, the supporting portion R**731** of the developing unit **7** is provided with locking portions **731**A and notch portions **731**B.

FIG. **17**A shows a state before the rotational operation of the toner cartridge **9** is performed in the process of attaching the toner cartridge **9**. In the state shown in FIG. **17**A, since the closing portion **95**B (FIG. **12**) of the discharge side shutter **95** and the discharge opening **94**A (FIG. **12**) face each other, the discharge opening **94**A (FIG. **12**) is in a closed state. In this case, the locked protrusion **95**C is sandwiched between the locking portions **731**A, and a rotational operation of the discharge side shutter **95** with respect to the developing unit **7** is prohibited.

FIG. **17**B shows the fully attached state after the toner cartridge **9** is rotated. In this case, the toner cartridge **9** is rotated with respect to the developing unit **7** in a state in which the rotational operation of the discharge side shutter **95** is prohibited. Here, since the supported protrusions R**93**A can enter the notch portions **731**B, rotation of the discharge side shutter **95** is prohibited, but rotation of the toner cartridge **9** is not hindered.

As described above, the rotational operation of the toner cartridge **9** in the process of attaching the toner cartridge **9** causes the discharge side shutter **95** to rotate relatively inside the toner cartridge **9**. As a result, the position of the toner passing hole **95**A (FIG. **12**) of the discharge side shutter **95** and the position of the discharge opening **94**A (FIG. **12**) coincide with each other to open the discharge opening **94**A (FIG. **12**). Similarly, when the toner cartridge **9** is detached from the developing unit **7**, the discharge side shutter **95** rotates in conjunction with the rotational operation of the toner cartridge **9** to close the discharge opening **94**A (FIG. **12**).

Lift Mechanism of Toner Cartridge

Next, the lift mechanism **760** of the toner cartridge **9** will be described.

FIGS. **18**A to **18**C show movement of the lift mechanism **760** in the process of attaching the toner cartridge **9** to the developing unit **7**. FIG. **18**A shows a state in which the developing unit **7** is attached to the lift mechanism **760** during the attaching process of the toner cartridge **9**. FIG. **18**B shows a state in which the lift mechanism **760** is open during the attaching process of the toner cartridge **9**. FIG. **18**C shows a state in which the toner cartridge **9** has been attached.

FIGS. **19**A to **19**C show movement of shifting the toner cartridge **9** to a lift-up state using the lift mechanism **760** in the state in which the toner cartridge **9** is attached to the developing unit **7**. FIG. **19**A shows a state in which the toner cartridge **9** has been attached to the developing unit **7**. FIG. **19**B shows a state in which the toner cartridge **9** is lifted up by the lift mechanism **760**. FIG. **19**C shows a state in which the toner cartridge **9** is lifted up. Also, in FIGS. **19**A to **19**C, the side holder **719** of the developing unit **7** is omitted for convenience of explanation.

As shown in FIGS. **19**A to **19**C, the T side holder L**92** of the toner cartridge **9** is provided with a protruded portion **92**B, and the protruded portion **92**B includes a contact surface **92**C, a holding surface **92**D, and a receiving surface **92**E. Further, as shown in FIG. **5**, the lift mechanism **760** is configured of a boss **719**A, a lift member **761**, and a torsion coil spring **762** which are provided in the side holder **719** of the developing unit **7**. The lift member **761** and the torsion coil spring **762** are attached to the boss **719**A and can rotate around the boss **719**A. The lift member **761** has a contact region **761**A, an operation portion **761**B, and a raising portion **761**C. Further, the lift member **761** is biased in a direction of arrow R**1** due to the torsion coil spring **762**.

First, the movement of the lift mechanism **760** in the process of attaching the toner cartridge **9** will be described with reference to FIGS. **18**A to **18**C.

When the rotational operation of the toner cartridge **9** is performed during the attaching process of the toner cartridge **9**, as shown in FIG. **18**A, the contact surface **92**C and the contact region **761**A are in contact with each other, and the toner cartridge **9** is placed on the lift mechanism **760**. When the rotational operation of the toner cartridge **9** is continued, as shown in FIG. **18**B, the contact region **761**A is pushed by the contact surface **92**C, and the lift member **761** rotates in a direction of arrow R**2** to allow the rotational operation of the toner cartridge **9**. Further, when the rotational operation of the toner cartridge **9** is continued and the attachment of the toner cartridge **9** is completed, as shown in FIG. **18**C, the contact region **761**A is separated from the contact surface **92**C and comes into contact with the holding surface **92**D. The lift member **761** can keep the toner cartridge **9** in the fully attached state. That is, the lift member **761** is a support member for supporting the toner cartridge **9** on the process cartridge **5**. In this way, the lift mechanism **760** is an operation member that moves the toner cartridge **9** in the direction in which it is attached to the process cartridge **5**.

Next, movement of shifting the toner cartridge **9** from the fully attached state to the lift-up state will be described with reference to FIGS. **19**A to **19**C.

As shown in FIG. **19**A, in the fully attached state of the toner cartridge **9**, the contact region **761**A of the lift member **761** is in contact with the holding surface **92**D, and the toner cartridge **9** cannot be detached. In order to detach the toner cartridge **9**, as shown in FIG. **19**B, the operation portion **761**B of the lift member **761** is operated to rotate the lift member **761** in the direction of arrow R**2**. Thus, the raising portion **761**C of the lift member **761** comes into contact with the receiving surface **92**E, and the toner cartridge **9** can be rotated. After that, when the operation portion **761**B is open, as shown in FIG. **19**C, the lift member **761** rotates in the direction of arrow R**1** due to a biasing force of the torsion coil spring **762**. The contact surface **92**C and the operation portion **761**B are in a contact state, and the toner cartridge **9** is in a lift-up state on the lift mechanism **760**. This makes it possible to detach the toner cartridge **9**. In this way, the lift mechanism **760** moves the toner cartridge **9** in the direction in which it is detached from the process cartridge **5**.

Arrangement of Memory Tags

Next, a storage member according to the first embodiment will be described. FIG. **20** is a perspective view of the cartridge unit **10** from diagonally above, and FIG. **21** is a perspective view thereof from diagonally below. The cartridge unit **10** has a second memory tag **101** serving as a second storage member of the process cartridge **5** and a first memory tag **102** serving as a first storage member of the toner cartridge **9**.

The second memory tag **101** and the first memory tag **102** each have a memory substrate, a memory chip (storage element) provided on the memory substrate for storing information, and memory contacts electrically connected to the memory chip. The memory chip may be disposed inside the memory substrate. The memory contacts are, for example, electrodes provided on the memory substrate. As the memory contacts, the second memory tag **101** has second memory contacts **101***a*, and the first memory tag **102** has first memory contacts **102***a*. The second memory tag **101** has a second memory chip (second storage element), the second memory contacts **101***a* electrically connected to the second memory chip, and a second contact arrangement surface on which the second memory contacts **101***a* are disposed. The first memory tag **102** has a first memory chip (first storage element), the first memory contacts **102***a* electrically connected to the first memory chip, and a first contact arrangement surface on which the first memory contacts **102***a* are disposed. The first memory tag **102** is disposed on the top surface of the process cartridge **5** in a posture in which the cartridge unit **10** is used. As can be understood from FIG. **20**, the first memory tag **102** is disposed at a position separated from the discharge opening forming member **94** and the discharge side shutter **95**.

The number of the second memory contacts **101***a* and the number of the first memory contacts **102***a* are both four. The four second memory contacts **101***a* are arranged in a direction perpendicular to the attaching direction of the cartridge unit **10** and in the left to right direction of the process cartridge **5**. The four first memory contacts **102***a* are arranged in the direction perpendicular to the attaching direction of the cartridge unit **10** and in the left to right direction of the toner cartridge **9**. The second memory tag **101** and the first memory tag **102** can store and transmit various information. Information is transmitted between the apparatus main body **2** and the second memory contacts **101***a* by making electrical contacts between the second memory contacts **101***a* and main body memory contacts of the apparatus main body **2**. Information is transmitted between the apparatus main body **2** and the first memory contacts **102***a* by making electrical contacts between the first memory contacts **102***a* and the main body memory contacts of the apparatus main body **2**.

Different information is stored in each of the second memory tag **101** and the first memory tag **102**. The second memory tag **101** provided in the process cartridge **5** stores information about the process cartridge **5**. For example, the information about the process cartridge **5** is information about a printing usage history of the photosensitive drum **61** and the developing roller **71** provided in the process cartridge **5**, etc. The first memory tag **102** provided on the toner cartridge **9** stores information about the toner cartridge **9**. For example, the information about the toner cartridge **9** is information about a remaining amount of toner contained in the toner cartridge **9**, etc. By reading this information in the apparatus main body **2**, control of the apparatus main body **2**, such as notifying of replacement of the process cartridge **5** and the toner cartridge **9** with new cartridges, is performed.

Next, the arrangement of the second memory tag **101** and the first memory tag **102** in an axis direction will be described. Here, the axis direction is the rotational axis direction of the photosensitive drum **61** (left to right direction) or the rotational axis direction of the developing roller **71** (left to right direction) and is simply referred to as the axis direction in the following description. In FIG. **21**, the second memory tag **101** is disposed on a left side of a lower surface of the process cartridge **5**. In FIG. **20**, the first memory tag **102** is disposed on a right side of an upper surface of the toner cartridge **9**. The toner cartridge **9** has the discharge opening **94**A serving as a developer discharge opening for discharging toner to the process cartridge **5**. The discharge opening **94**A of the toner cartridge is provided on a right side of the toner cartridge **9**. As described above, in the longitudinal direction (axis direction) of the toner cartridge **9**, the discharge opening **94**A and the first memory tag **102** are disposed on one end side with respect to a center of the toner cartridge **9**. The fact that some members (in this case, the discharge opening **94**A and the first memory tag **102**) are disposed on one end side with respect to the center of the toner cartridge **9** in the axis direction indicates that a distance between an end portion of the toner cartridge **9** on one end side and the members in the axis direction is shorter than a distance between an end portion of the toner cartridge **9** on the other end side opposite to the one end side and the members. Similarly, the fact that some members are disposed on the other end side with respect to the center of the toner cartridge **9** in the axis direction indicates that the distance between the end portion of the toner cartridge **9** on the other end side and the members in the axis direction is shorter than the distance between the end portion of the toner cartridge **9** on one end side and the members. The lift mechanism **760**, which is a support member for supporting the toner cartridge **9** on the process cartridge **5**, is provided on a left side of the toner cartridge **9**. That is, the first memory tag **102** is disposed on the same side as the discharge opening **94**A with respect to the center of the toner cartridge **9** in the axis direction and is disposed on the side opposite to the lift mechanism **760**. Therefore, in the longitudinal direction (axis direction) of the toner cartridge **9**, the lift mechanism **760** is disposed on the other end side opposite to one end side with respect to the center of the toner cartridge **9**. Also, the second memory tag **104** can also be disposed on one end side with respect to the center of the toner cartridge **9**.

Further, the arrangement of the first memory tag **102** will be described with reference to FIG. **22**. FIG. **22** is a side view of the cartridge unit **10** from a right side. As described above, the toner cartridge **9** is attached to the process cartridge **5** by rotating the toner cartridge **9**. A position **9***p* of the toner cartridge **9** before the toner cartridge **9** rotates is shown by a dotted line in FIG. **22**. Also, a rotating direction of the toner cartridge **9** is indicated by arrow S**4** in FIG. **22**. The rotating direction S**4** of the toner cartridge **9** is the attaching direction of the toner cartridge **9** to the process cartridge **5**. FIG. **22** shows a position **9***r* of the toner cartridge **9** when the toner cartridge **9** rotates and the toner cartridge **9** is attached to the process cartridge **5**. As can be seen from FIG. **22**, when the toner cartridge **9** moves from the position **9***p* to the position **9***r*, the first memory tag **102** moves integrally with the T side holder L**92**, the T side holder R**93**, and the toner container **910**. In a state in which the toner cartridge **9** is in contact with the process cartridge **5**, the toner cartridge **9** moves from the position **9***p* (a first position) to the position **9***r* (a second position), and the toner cartridge **9** is positioned on the process cartridge **5**. In this case, the toner cartridge **9** rotates from the position **9***p* to the position **9***r* in a state in which the supported protrusion L**92**A is supported by the supporting portion L**730** and the supported protrusion R**93**A is supported by the supporting portion R**731** (the state shown in FIG. **15**B). The position **9***r* (second position) of the toner cartridge **9** when the toner cartridge **9** is positioned with respect to the process cartridge **5** is a fully attached position or a positioning position of the toner cartridge **9** with respect to the process cartridge **5**. The position of the first memory tag **102** when the toner cartridge **9** is at the position **9***r* in the up and down direction (vertical direction) is lower than the position of the first memory tag **102** when the toner cartridge **9** is at the position **9***p*. Also, as can be seen from FIGS. **17**A, **17**B, **20** and **22**, a distance between a rotational center of the toner cartridge **9** (supported protrusion L**92**A and supported protrusion R**93**A) and the discharge opening **94**A in a direction orthogonal to the longitudinal direction of the toner cartridge **9** is shorter than a distance between the rotational center of the toner cartridge **9** and the first memory tag **102**. Further, when the toner cartridge **9** is at the position **9***r*, the first memory tag **102** is located at the highest position in the toner cartridge **9** in the up and down direction. In addition, as can be understood from FIGS. **9** and **22**, in the up and down direction, the first memory tag **102** is located above upper ends of the left side wall **611** and the right side wall **612**.

The first memory tag **102** has the first contact arrangement surface on which the first memory contacts **102***a* are disposed. The apparatus main body **2** has first main body memory contacts **104***a* that comes into contact with the first memory contacts **102***a* when the cartridge unit **10** is attached to the apparatus main body **2**. The first memory contact **102***a* has a first memory contact surface that comes into contact with the first main body memory contact **104***a*. When the cartridge unit **10** is attached to the apparatus main body **2**, the first memory contact **102***a* receives a pressing force from the first main body memory contact **104***a* of the apparatus main body **2** and comes into contact with the first main body memory contact **104***a*. A direction of this pressing force is indicated by arrow F**1**. The direction F**1** of the pressing force is the same as the rotating direction S**4** when the toner cartridge **9** is attached. That is, the first memory contact **102***a* receives the pressing force from the first main body memory contact **104***a* of the apparatus main body **2**, and the toner cartridge **9** is pressed from the position **9***p* toward the position **9***r*. The first memory contact **102***a* has the first memory contact surface extending parallel to the front to rear direction and the left to right direction. The first memory contact surface of the first memory contact **102***a* may be formed at the same height as the first contact arrangement surface of the first memory tag **102**. There may be a step between the first contact arrangement surface of the first memory tag **102** and the first memory contact surface of the first memory contact **102***a*. A normal direction M**1** of the first memory contact surface facing in a direction in which the first memory contact **102***a* is exposed on the first contact arrangement surface faces in a direction opposite to the rotating direction S**4**. That is, the normal direction M**1** of the first memory contact surface faces in a direction opposite to the direction (rotating direction S**4**) in which the toner cartridge **9** is directed from the position **9***p* (first position) to the position **9***r* (second position). The first contact arrangement surface and the first memory contact surface are parallel to each other. Therefore, the normal direction M**1** of the first contact arrangement surface facing in the direction in which the first memory contact **102***a* is exposed faces in the direction opposite to the rotating direction S**4**. That is,

the normal direction M1 of the first contact arrangement surface faces in a direction opposite to the direction (rotating direction S4) in which the toner cartridge **9** is directed from the position **9***p* (first position) to the position **9***r* (second position). As a result, the direction F1 of the pressing force mentioned above and the rotating direction S4 become the same direction.

Here, meanings of the same direction and an opposite direction will be described with reference to FIGS. **23**A to **23**D. FIGS. **23**A to **23**D are schematic diagrams showing the same direction and the opposite direction in the present invention. The fact that two directions are in the same direction does not indicate that the two directions face in exactly the same direction, but that the two directions have directional components in the same direction. That is, in FIG. **23**A, when an angle formed by a predetermined direction with respect to a reference direction B1 is in a range A1 between −90 degrees and 90 degrees not including −90 degrees and 90 degrees, the two directions are defined as in the same direction. Further, as shown in FIG. **23**B, when an angle formed by two directions is in a range A2 between 45 degrees and −45 degrees, the components in the same direction become stronger, and thus it is more effective for effects of the present invention, which will be described later.

On the other hand, the opposite direction indicates that two directions have directional components in opposite directions. That is, in FIG. **23**C, when an angle formed by a predetermined direction with respect to the reference direction B1 is in a range A3 between 90 degrees and −90 degrees not including 90 degrees and −90 degrees, the two directions are defined as in opposite directions. Also, as shown in FIG. **23**D, when the angle formed by the two directions is in a range A4 between 135 degrees and −135 degrees, the components in the opposite directions become stronger, and thus it is more effective for effects of the present invention, which will be described later.

Next, positioning of the cartridge unit **10** with respect to the apparatus main body **2** will be described with reference to FIGS. **24** and **25**. FIG. **24** is a perspective view of the cartridge unit **10** from diagonally above. FIG. **25** is a side view of the cartridge unit **10** from a right side.

The process cartridge **5** of the cartridge unit **10** is provided with a positioned protrusion **105***a* serving as a positioned portion and a positioned protrusion **105***b* serving as a rotation restricted portion. The positioned protrusions **105***a* and **105***b* are provided on front and rear sides of the process cartridge **5** to protrude in the axis direction from the left side wall **611** and the right side wall **612** of the frame **610**, respectively. In the attaching direction of the process cartridge **5**, the positioned protrusion **105***a* provided on the front side of the process cartridge **5** is provided coaxially with the photosensitive drum **61**. As can be seen from FIGS. **12**, **15**A, **20** and **24**, in the present embodiment, the first memory tag **102** is attached to the T side holder R**93**. However, the first memory tag **102** may be attached to the toner container **910**.

The apparatus main body **2** has a guide groove **106** serving as a positioning portion for supporting the positioned protrusions **105***a* and **105***b*. The guide groove **106** is shown by a dotted line in FIG. **25**. The cartridge unit **10** moves rearward with respect to the apparatus main body **2** and is attached to the apparatus main body **2**. When the cartridge unit **10** is attached, the positioned protrusions **105***a* and **105***b* pass through the inside of the guide groove **106** along the guide groove **106**. When the positioned protrusions **105***a* and **105***b* pass through the inside of the guide groove **106**, an upper surface **106***a* and a lower surface **106***b* (rotation restricted portions) of the guide groove **106** restrict vertical movement of the positioned protrusions **105***a* and **105***b*. As a result, movement of the cartridge unit **10** in the up and down direction with respect to the apparatus main body **2** at the time of attaching the cartridge unit **10** is restricted. Further, in the posture in which the cartridge unit **10** is used, movement of the cartridge unit **10** in the direction of gravity is restricted.

FIG. **25** shows a state in which the cartridge unit **10** has been attached to the apparatus main body **2** and the cartridge unit **10** has been positioned on the apparatus main body **2**. The guide groove **106** has a positioning groove **106***c* formed on an inner side of the guide groove **106** in the attaching direction of the process cartridge **5**. The positioning groove **106***c* has a lower surface **106***d* continuous with a lower surface **106***b* of the guide groove **106**, and a vertical surface **106***e* extending in the vertical direction from the lower surface **106***d*. A biasing force directed rearward and downward is applied to the process cartridge **5** by a biasing member (not shown) provided on the apparatus main body **2**. Due to this biasing force, the positioned protrusion **105***a* comes into contact with the lower surface **106***d* and the vertical surface **106***e* of the positioning groove **106***c*, and the positioned protrusion **105***a* is positioned in the guide groove **106**. Further, due to this biasing force, the positioned protrusion **105***b* provided on a rear side of the process cartridge **5** comes into contact with the lower surface **106***b* of the guide groove **106**, and the positioned protrusion **105***b* is positioned in the guide groove **106**. By determining the position of the positioned protrusion **105***a*, a position of the cartridge unit **10** is determined in a direction orthogonal to the rotation axis of the photosensitive drum **61**. On the other hand, by determining the position of the positioned protrusion **105***b*, the cartridge unit **10** is restricted from rotating around the positioned protrusion **105***a*. In other words, the posture of the cartridge unit **10** is determined. More specifically, the positioned protrusion **105***a* is restricted from moving in the horizontal direction and the vertical direction by the guide groove **106**. Movement of the positioned protrusion **105***b* in the vertical direction is restricted by the guide groove **106**. As described above, the cartridge unit **10** is positioned in the apparatus main body **2**. In addition, the opposite side of the cartridge unit **10** in the longitudinal direction is also positioned by the same configuration. Also, the positioned protrusion **105***a* may be configured to be subjected to rearward and upward biasing forces due to a biasing member (not shown) provided on the apparatus main body **2**. In this case, due to this biasing force, the positioned protrusion **105***a* comes into contact with an upper surface (on a side opposite to the lower surface **106***d*) of the positioning groove **106***c* and the vertical surface **106***e*, and the positioned protrusion **105***a* is positioned in the guide groove **106**.

Here, the direction F1 of the pressing force from the first main body memory contact **104***a* acting on the first memory contact **102***a* described above is the same as the direction P1 in which the positioned protrusion **105***b* comes into contact with the lower surface **106***b* of the guide groove **106**. That is, the normal direction M1 of the first memory contact surface facing in the direction in which the first memory contact **102***a* is exposed (the same as the normal direction M1 of the first contact arrangement surface) faces in the opposite direction to the direction (pressing direction) P1 in which the positioned protrusion **105***b* comes into contact with the guide groove **106**. As a result, the pressing force direction F1 and the positioning direction P1 become the

same direction. The positioned protrusion **105***b* comes into contact with the lower surface **106***b* to restrict the rotation around the positioned protrusion **105***a*. Further, in FIG. **25**, the distance b in the front to rear direction between the position of the positioned protrusion **105***a* and the position of the positioned protrusion **105***b* is set to be larger than the distance a in the front to rear direction between the position of the positioned protrusion **105***b* and a position of a line along the pressing force direction F**1**. Also, the distance a is equal to the distance in the front to rear direction between the position of the positioned protrusion **105***b* and the position at which the first memory contact **102***a* and the first main body memory contact **104***a* come into contact with each other. That is, a relationship between the position of the positioned protrusion **105***a*, the position of the positioned protrusion **105***b*, and the position of the line along the pressing force direction F**1** in the front to rear direction becomes the distance a<the distance b. In addition, in the front to rear direction, the position at which the first memory contact **102***a* and the first main body memory contact **104***a* come into contact with each other is located at a position farther from the positioned protrusion **105***a* than the positioned protrusion **105***b* is. Moreover, as can be seen from FIG. **25**, the distance between the first memory contact **102***a* and the positioned protrusion **105***a* is longer than the distance between the positioned protrusion **105***b* and the positioned protrusion **105***a*.

Effects of the first embodiment will be described below. First, the effect of arrangement of the first memory tag **102** in the axis direction will be described. The first memory tag **102** is provided on the same side as the discharge opening **94**A of the toner cartridge **9** in the axis direction and is provided on the side opposite to the lift mechanism **760** of the toner cartridge **9**. Since the lift mechanism **760** is a part directly operated by the user who uses the printer (image forming apparatus), it is necessary to keep the lift mechanism **760** clean so that it does not stain the user's hands. For this reason, the lift mechanism **760** is disposed on the side opposite to the discharge opening **94**A in the axis direction to separate the lift mechanism **760** from the discharge opening **94**A of the toner cartridge **9** at which toner stains are likely to occur.

Further, if the first memory contact **102***a* becomes dirty, information transmission between the apparatus main body **2** and the first memory tag **102** may become unstable, and it is also necessary to prevent the first memory contact **102***a* from becoming dirty. For this reason, by disposing the first memory tag **102** on the side opposite to the lift mechanism **760** in the axis direction, it is possible to prevent the first memory contact **102***a* from becoming dirty due to the user accidentally touching the first memory contact **102***a* when operating the lift mechanism **760**.

As described above, usability can be improved by preventing toner stains on the user's hands. Further, by preventing the user from accidentally touching the first memory contact **102***a*, it is possible to prevent the first memory contact **102***a* from becoming dirty and to reliably transmit information between the apparatus main body **2** and the first memory tag **102**.

Next, the effect of arrangement of the first memory tag **102** in a cross-sectional direction perpendicular to the axis direction will be described. The first memory tag **102** is disposed such that the direction F**1** of the pressing force received by the first memory contact **102***a* from the first main body memory contact **104***a* of the apparatus main body **2** is the same as the rotating direction S**4** when the toner cartridge **9** is attached. With the pressing force from the first main body memory contact **104***a*, the toner cartridge **9** can be stably pressed in the attaching direction (rotating direction S**4**) on the process cartridge **5**. Therefore, the position accuracy of the toner cartridge **9** with respect to the process cartridge **5** can be improved. In addition, by improving the position accuracy of the toner cartridge **9**, the position accuracy of the first memory contact **102***a* with respect to the first main body memory contact **104***a* is improved, and thus both can be reliably electrically connected and certainty of information transmission can be improved.

Next, another effect regarding the configuration of the first embodiment will be described. As described above, the lift mechanism **760** has a function of preventing the toner cartridge **9** from coming off the process cartridge **5**. Accordingly, on the side on which the lift mechanism **760** is disposed in the axis direction, the position accuracy of the toner cartridge **9** with respect to the process cartridge **5** can be ensured by the lift mechanism **760**. On the other hand, in a case in which the first memory tag **102** is disposed on the side on which the lift mechanism **760** is not disposed in the axis direction, the toner cartridge **9** is stably pressed in the attaching direction (rotating direction S**4**) due to the pressing force on the first memory contact **102***a*, instead of the lift mechanism **760**. The position accuracy of the toner cartridge **9** with respect to the process cartridge **5** can be ensured due to the pressing force on the first memory contact **102***a*. As a result, the first memory contact **102***a* and the first main body memory contact **104***a* can be reliably electrically connected, and the certainty of information transmission can be improved.

Further, the effect regarding the arrangement of the first memory tag **102** will be described. The first memory tag **102** is disposed such that the direction F**1** of the pressing force received by the first memory contact **102***a* from the first main body memory contact **104***a* is in the same direction as the direction P**1** in which the positioned protrusion **105***b* comes into contact with the guide groove **106** which is the positioning portion of the apparatus main body **2**. As a result, since the positioned protrusion **105***b* of the process cartridge **5** can reliably come into contact with the lower surface **106***b* of the guide groove **106** due to the pressing force, positioning of the process cartridge **5** with respect to the apparatus main body **2** can be performed more reliably.

In FIG. **25**, the relationship between the position of the positioned protrusion **105***a*, the position of the positioned protrusion **105***b*, and the position of the line along the pressing force direction F**1** in the front to rear direction becomes the distance a<the distance b. Due to the pressing force received by the first memory contact **102***a* from the first main body memory contact **104***a*, an upward rotational moment indicated by arrow S**5** in FIG. **25** is generated in the positioned protrusion **105***a* with the contacted position between the positioned protrusion **105***b* and the guide groove **106** as a fulcrum. As described above, the biasing force directed downward and rearward is applied to the cartridge unit **10** by the biasing member (not shown) provided on the apparatus main body **2** for positioning on the apparatus main body **2**. However, in a case in which a force of the rotational moment S**5** acting in the direction opposite to the direction of the biasing force is large, the positioning of the cartridge unit **10** may become unstable. Therefore, the relationship between the position of the positioned protrusion **105***a*, the position of the positioned protrusion **105***b*, and the position of the line along the pressing force direction F**1** in the front to rear direction is set to be the distance a<the distance b. For this reason, the force of the rotational moment (S**5**) can be inhibited to be small with respect to the

pressing force received by the first memory contact **102***a* from the first main body memory contact **104***a*. As a result, the positioning of the cartridge unit **10** with respect to the apparatus main body **2** can be stabilized. As described above, the pressing force of the first main body memory contact **104***a* generates a moment in the direction in which the positioned protrusion **105***a* is biased upward. Therefore, in a case in which the biasing force directed upward and rearward is applied to the positioned protrusion **105***a* and the cartridge unit **10** is positioned, the pressing force of the first main body memory contact **104***a* can assist with the upward positioning of the positioned protrusion **105***a*.

Second Embodiment

Next, a second embodiment will be described. In the second embodiment, parts that are different from those of the first embodiment will be described in detail. Unless otherwise specified, the second embodiment has the same configuration as the first embodiment, and thus the same components as those in the first embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIGS. **26** and **27**. FIG. **26** is a perspective view of the cartridge unit **10** from diagonally above, and FIG. **27** is a perspective view of the cartridge unit **10** from diagonally below. As shown in FIG. **27**, a second memory tag **107** is provided on a right side of the lower surface of the process cartridge **5**. The cartridge unit **10** has the second memory tag **107** as the second storage member of the process cartridge **5** and the first memory tag **102** as the first storage member of the toner cartridge **9**. The second memory tag **107** in the second embodiment is miniaturized more than the second memory tag **101** in the first embodiment described above. The number of the second memory contacts **101***a* in the second embodiment is two, which is less than the four second memory contacts **101***a* described above. The second memory tag **107** of the second embodiment can store and transmit various information in the same manner as the second memory tag **101** described above.

As shown in FIG. **26**, the first memory tag **102** is provided on a left side of the upper surface of the toner cartridge **9**. Further, the discharge opening **94**A of the toner cartridge **9** and the electrical contacts **720**A and **720**B of the process cartridge **5** are provided on a right side of the cartridge unit **10**. That is, the first memory tag **102** is provided on the side opposite to the discharge opening **94**A of the toner cartridge **9** and the electrical contacts **720**A and **720**B of the process cartridge in the axis direction. Therefore, in the longitudinal direction (axis direction) of the toner cartridge **9**, the discharge opening **94**A is disposed on one end side with respect to the center of the toner cartridge **9**, and the first memory tag **102** is disposed on the other end side opposite to the one end side with respect to the center of the toner cartridge **9**. In addition, the second memory tag **107** is disposed on one end side with respect to the center of the cartridge unit **10** in the axis direction. The position of the first memory tag **102** in the present embodiment is the same as the position of the first memory tag **102** in the first embodiment in the front to rear direction and the left to right direction. As can be seen from FIG. **26**, the first memory tag **102** is disposed at a position separated from the discharge opening forming member **94** and the discharge side shutter **95**. In the present embodiment, as can be seen from FIGS. **12**, **15**A and **26**, the first memory tag **102** is attached to the T side holder L**92**. However, the first memory tag **102** may be attached to the toner container **910**.

The effects of the second embodiment will be described below. In the second embodiment, by using the miniaturized second memory tag **107**, it is possible to dispose the second memory tag **107** even in a small space of the process cartridge **5**. In addition, the first memory tag **102** is disposed on the side opposite to the discharge opening **94**A of the toner cartridge **9** in the axis direction, and the first memory tag **102** is separated from the discharge opening **94**A at which toner stains are likely to occur, so that the toner stains of the first memory contact **102***a* can be prevented. Further, the first memory tag **102** is disposed on the side opposite to the electrical contacts **720**A and **720**B in the axis direction, and the first memory tag **102** is separated from the electrical contacts **720**A and **720**B. For that reason, the first memory tag **102** can be released from influence of electrical noise generated from the electrical contacts **720**A and **720**B. As a result, stability of information transmission can be improved.

Other configurations of the second embodiment will be described. The memory tags may be disposed as follows. As shown in FIG. **26**, the first memory tag **102** may be provided on the left side of the upper surface of the toner cartridge **9**, and as shown in FIG. **21**, the second memory tag **101** may be provided on the left side of the lower surface of the process cartridge **5**. By doing so, the second memory tag **101** and the first memory tag **102** can be provided on the sides opposite to the electrical contacts **720**A and **720**B in the axis direction, and thus they can be released from the influence of electrical noise generated from the electrical contacts **720**A and **720**B. As a result, the stability of information transmission can be improved. That is, the second memory tag **107** can be disposed on the other end side with respect to the center of the toner cartridge **9**.

Third Embodiment

Next, a third embodiment will be described. In the third embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the third embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIG. **28**. FIG. **28** is a perspective view of the cartridge unit **10** from diagonally above. The toner cartridge **9** has an end surface (a right end surface in FIG. **28**) extending in a direction crossing the axis direction at an end portion in the axis direction (a right end portion in FIG. **28**). In the present embodiment, the right end surface extends in a direction orthogonal to the longitudinal direction of the toner cartridge **9**. However, the right side surface may be inclined with respect to a plane orthogonal to the longitudinal direction of the toner cartridge **9**. The first memory tag **102** is disposed on the right end surface of the toner cartridge **9** such that the first contact arrangement surface and the first memory contact surface of the first memory contact **102***a* face rightward with respect to the axis direction. That is, in the axis direction, the first contact arrangement surface and the first memory contact surface of the first memory contact **102***a* are disposed to face the outside of the toner cartridge **9**. In addition, the first memory contact **102***a* is disposed at a position at which the first

memory contact **102***a* is inserted inside the cartridge unit **10** toward the left in the axis direction. Further, as in the second embodiment, in the axis direction, the first memory tag **102** is disposed on one end side with respect to the center of the cartridge unit **10**, and the second memory tag **107** is disposed on the other end side opposite to the one end side with respect to the center of the cartridge unit **10**. As can be seen from FIGS. **12**, **15**A and **28**, the first memory tag **102** is attached to the T side holder R**93**. Also, the second memory tag **107** can also be disposed on one end side with respect to the center of the toner cartridge **9**.

FIG. **29** is a perspective view showing a state in which the cartridge unit **10** is attached to the apparatus main body **2** and the first memory contact **102***a* is in contact with the first main body memory contact **104***a*. After the cartridge unit **10** is attached to the apparatus main body **2**, the first main body memory contact **104***a* is moved leftward in the axis direction (in a direction of arrow C**1** in FIG. **29**) by a mechanism (not shown) provided in the apparatus main body **2**. As a result, the first memory contact **102***a* and the first main body memory contact **104***a* can be satisfactorily electrically connected to each other.

Effects of the third embodiment will be described. The first memory tag **102** is disposed on the side end surface of the toner cartridge **9** such that the first contact arrangement surface and the first memory contact surface of the first memory contact **102***a* face in the axis direction. This eliminates the need to dispose the first memory tag **102** on the upper surface of the toner cartridge **9**. For this reason, the cartridge unit **10** and the apparatus main body **2** can be miniaturized in the up and down direction. Miniaturizing the apparatus body **2** in the up and down direction is particularly effective in reducing a size of the entire apparatus in the up and down direction in a multifunctional printer in which a document reading apparatus is disposed on an upper portion of the apparatus main body **2**.

Fourth Embodiment

Next, a fourth embodiment will be described. In the fourth embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the fourth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIGS. **30** and **31**. FIG. **30** is a perspective view of the cartridge unit **10** from diagonally above. FIG. **31** is a front view of the cartridge unit **10** in the attaching direction. Similar to the third embodiment, the toner cartridge **9** has an end surface (right end surface in FIG. **30**) extending in a direction crossing the axis direction at an end portion in the axis direction (right end portion in FIG. **30**). Similar to the third embodiment, the first memory tag **102** is disposed such that the first contact arrangement surface and the first memory contact surface of the first memory contact **102***a* are directed rightward with respect to the axis direction on the right end surface of the toner cartridge **9**. Further, when viewed in the attaching direction of the cartridge unit **10**, the first memory tag **102** is disposed such that the first memory contact **102***a* is located on an outermost side of the cartridge unit **10** in the axis direction. To be precise, when the cartridge unit **10** is attached, the first memory contact **102***a* is located on the outermost side of the cartridge unit **10** in the axis direction in an area through which the first memory tag **102** passes. Explaining with reference to FIG. **31**, when viewed in the attaching direction of the cartridge unit **10**, an area A**1** is defined as an area in which the first memory contact **102***a* is provided in the direction perpendicular to the axis direction. In this case, the first memory contact **102***a* is disposed such that the first memory contact **102***a* is located further outward and rightward in the area A**1** than an outermost position P**2** on a right side of the cartridge unit **10** in the axis direction excluding the first memory tag **102**. That is, the first memory contact **102***a* is disposed at the most protruding position of the toner cartridge **9** or the cartridge unit **10** toward the outside in the axis direction. Also, when the cartridge unit **10** is attached, there may be a portion located outside the area through which the first memory tag **102** passes in the axis direction with respect to the first memory contact **102***a*. Further, with respect to the attaching direction of the cartridge unit **10**, there may be a portion located outside the first memory contact **102***a* in the axis direction in an area on an upstream side of the first memory tag **102**. As can be seen from FIGS. **12**, **15**A and **30**, the first memory tag **102** is attached to the T side holder R**93**.

FIG. **32** is a perspective view showing a state during attaching when the cartridge unit **10** is attached to the apparatus main body **2**. FIG. **33** is a perspective view showing a state in which the cartridge unit **10** is attached to the apparatus main body **2** and the first memory contact **102***a* is in contact with the first main body memory contact **104***a*. In this way, the first memory contact **102***a* and the first main body memory contact **104***a* come into contact with each other through the operation of moving the cartridge unit **10** in the attaching direction (arrow S**1** direction) when the cartridge unit **10** is attached. As a result, the first memory contact **102***a* and the first main body memory contact **104***a* are electrically connected to each other. Further, in the fourth embodiment, unlike the third embodiment described above, the apparatus main body **2** is not provided with a mechanism for moving the first main body memory contact **104***a* in the C**1** direction (see FIG. **29**). However, as in the third embodiment, the apparatus main body **2** may be provided with the mechanism for moving the first main body memory contact **104***a* in the C**1** direction (see FIG. **29**).

Next, positioning of the first main body memory contacts **104***a* will be described with reference to FIGS. **30**, **32**, and **33**. The first main body memory contacts **104***a* are configured to be movable in the vertical direction. As shown in FIG. **30**, the toner cartridge **9** is provided with a positioning groove **108** which is a positioning portion of the first main body memory contacts **104***a*. The positioning groove **18** determines positions of the first main body memory contacts **104***a*. On the other hand, as shown in FIG. **32**, a positioned protrusion **109**, which is a positioned portion that engages with the positioning groove **108**, is provided on the apparatus main body **2** side. The first main body memory contacts **104***a* are positioned with respect to the first memory contacts **102***a* by engaging the positioning groove **108** shown in FIG. **33** with the positioned protrusion **109** in the up and down direction (vertical direction), which is a direction in which a plurality of first memory contacts **102***a* are arranged. The first main body memory contacts **104***a* are positioned with respect to the first memory contacts **102***a* such that the plurality of first memory contacts **102***a* are arranged in a row and a plurality of first main body memory contacts **104***a* are arranged in a row in the vertical direction in the posture when the cartridge unit **10** is used. More specifically, the first main body memory contacts **104***a* are positioned in a direction crossing the attaching direction of the cartridge

unit **10** and in a direction crossing the rotational axis direction of the photosensitive drum **61**.

Effects of the fourth embodiment will be described below. When viewed in the attaching direction of the cartridge unit **10**, the first memory tag **102** is disposed on the toner cartridge **9** such that the first memory contacts **102***a* are located on the outermost side of the cartridge unit **10** in the axis direction. As a result, the first memory contacts **102***a* and the first main body memory contacts **104***a* can be appropriately electrically connected to each other through the operation of attaching the cartridge unit **10** on the apparatus main body **2**. According to the present configuration, it is not necessary to provide a moving mechanism for the first main body memory contacts **104***a*, unlike the third embodiment, so that the configuration of the apparatus main body **2** can be simplified.

Also, the toner cartridge **9** is provided with the positioning portion with the first main body memory contacts **104***a*. Thus, the positioning accuracy between the first memory contacts **102***a* and the first main body memory contacts **104***a* is improved, so that transmission of information can be reliably performed. Further, by improving the positioning accuracy, sizes of the first contact arrangement surface and the first memory contact surface of the first memory contact **102***a* can be miniaturized, and thus the entire outer shape of the first memory tag **102** can be miniaturized. In addition, the positioning of the first memory contacts **102***a* and the first main body memory contacts **104***a* is performed in the direction in which the plurality of first memory contacts **102***a* are arranged. As a result, since it is possible to reduce sizes of the plurality of first memory contacts **102***a*, the size of the first memory tag **102** can be reduced more effectively.

Fifth Embodiment

Next, a fifth embodiment will be described. In the fifth embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the fifth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIG. **34**. FIG. **34** is a perspective view of the cartridge unit **10** from diagonally above. Similar to the third and fourth embodiments, the toner cartridge **9** has an end surface (right end surface in FIG. **34**) extending in the direction crossing the axis direction at the end portion in the axis direction (right end portion in FIG. **34**). Similar to the third and fourth embodiments, a first memory tag **110** is disposed on the right end surface of the toner cartridge **9** such that a first contact arrangement surface and a first memory contact surface of a first memory contact **110***a* are directed rightward in the axis direction. That is, in the axis direction, the first contact arrangement surface and the first memory contact surface of the first memory contact **110***a* are disposed to face the outside of the toner cartridge **9**. The first memory tag **110** in the fifth embodiment is miniaturized more than the first memory tag **102** in each of the above-described embodiments, and the number of the first memory contacts **110***a* of the fifth embodiment is smaller than the number of the first memory contacts **102***a*. Further, the first memory tag **110** of the fifth embodiment can store and transmit various information like the first memory tag **102**.

Support of Memory Tag

A support configuration of the first memory tag **110** will be described with reference to FIGS. **35** and **36**. FIG. **35** is a perspective view showing a state during attaching when the cartridge unit **10** is attached to the apparatus main body **2**. FIG. **36** is a cross-sectional view showing a state in which the cartridge unit **10** is attached to the apparatus main body **2** and the first memory contact **110***a* is in contact with a first main body memory contact **111***a*.

As shown in FIG. **36**, the first memory tag **110** is supported by a memory support base **112** serving as a supporting portion using a fixing means such as double-sided tape. The memory support base **112** has a fixing portion **112***a* for fixing the first memory tag **110** and a restricting portion **112***b* formed to protrude in the up and down direction and the front to rear direction. The toner cartridge **9** has the T side holder R**93** and a memory cover **113** fixed to the T side holder R**93** using a fixing means such as a screw (not shown). The T side holder R**93** and the memory cover **113** are examples of a first frame.

The first memory tag **110** supported by the memory support base **112** is exposed to the outside through a hole portion **113***a* formed in the memory cover **113**. By forming the hole portion **113***a* such that the hole portion **113***a* is larger than the outer shape of the memory support base **112**, the memory support base **112** can move in the up and down direction and the front to rear direction with respect to the side holder R**93** and the memory cover **113**. The restricting portion **112***b* of the memory support base **112** is disposed in a space A**2** provided between the T side holder R**93** and the memory cover **113**. In the axis direction, a width B**1** of the restricting portion **112***b* in the left to right direction is formed to be smaller than a width B**2** of a space between the T side holder R**93** and the memory cover **113**.

A compression spring **114** is provided between the memory support base **112** and the T side holder R**93** to press the memory support base **112** rightward. In a state in which the cartridge unit **10** is not attached to the apparatus main body **2**, the restricting portion **112***b* of the memory support base **112** comes into contact with an inner surface of the memory cover **113** due to a biasing force of the compression spring **114**, and thus rightward movement of the memory support base **112** is restricted. In a case in which a leftward external force F**2** larger than the biasing force of the compression spring **114** is generated on the memory support base **112**, the restricting portion **112***b* of the memory support base **112** comes into contact with an outer surface of the T side holder R**93**, and thus leftward movement of the memory support base **112** is restricted. On the other hand, movement of the memory support base **112** in the up and down direction and the front to rear direction is restricted when the hole portion **113***a* of the memory cover **113** comes into contact with the memory support base **112**.

As described above, the memory support base **112** is movable with respect to the toner cartridge **9** in three directions of the up and down direction, the front to rear direction, and the left to right direction, but the memory support base **112** is supported such that the movement is restricted by a predetermined amount of movement. For example, the axis direction is defined as a first direction (left to right direction), a direction perpendicular to the first direction (left to right direction) is defined as the second direction (up and down direction), and a direction perpendicular to the second direction (up and down direction) is defined as a third direction (front to rear direction). Further, for example, the axis direction is defined set to the first direction (left to right direction), a direction perpendicular to

the first direction (left to right direction) is defined as the second direction (front to rear direction), and a direction perpendicular to the second direction (front to rear direction) is defined as the third direction (up and down direction). In these cases, the memory support base **112** is configured to be movable in each direction of the first direction, the second direction, and the third direction with respect to the side holder R**93** and the memory cover **113**.

Next, a positioning configuration of the first memory tag **110** will be described with reference to FIGS. **35** and **36**. The apparatus main body **2** is provided with the first memory contact holder **111** that supports the first main body memory contact **111***a*. An inclined inner wall surface **111***b* is formed on the first memory contact holder **111** to surround the first main body memory contact **111***a*. The memory support base **112** has an inclined surface **112***c* formed to come into contact with the inclined inner wall surface **111***b* in order to position the memory support base **112** with respect to the first memory contact holder **111**. The inclined surface **112***c* is formed to surround the fixing portion **112***a* of the memory support base **112**.

When the cartridge unit **10** is attached to the apparatus main body **2**, as shown in FIG. **36**, the biasing force of the compression spring **114** causes the inclined surface **112***c* of the memory support base **112** to come into contact with the inclined inner wall surface **111***b* of the first memory contact holder **111**. In addition, with the first memory contact **110***a* positioned with respect to the first main body memory contact **111***a*, the first memory contact **110***a* comes into contact with the first main body memory contact **111***a*. At this time, a gap is formed between the memory support base **112** and the hole portion **113***a* of the memory cover **113** in the up and down direction and the front to rear direction. Further, gaps are formed in the left to right direction between the restricting portion **112***b* of the memory support base **112** and the T side holder R**93**, and between the restricting portion **112***b* and the memory cover **113**. As a result, the memory support base **112** is positioned with respect to the first memory contact holder **111** in each direction of the up and down direction, the front to rear direction, and the left to right direction. As described above, the first memory contact **110***a* and the first main body memory contact **111***a* are accurately positioned with each other in three directions of the up and down direction, the front to rear direction, and the left to right direction.

Effects of the fifth embodiment will be described below. The memory support base **112** of the first memory tag **110** is supported on the toner cartridge **9** to be movable in three directions of the up and down direction, the front to rear direction, and the left to right direction. In addition, when the cartridge unit **10** is attached, the memory support base **112** on which the first memory tag **110** is supported is positioned in the three directions with respect to the first memory contact holder **111**. That is, the first memory contact **110***a* and the first main body memory contact **111***a* are accurately positioned with each other in the three directions. As a result, the positioning accuracy between the first memory contact **110***a* and the first main body memory contact **111***a* can be improved in the up and down direction and the front to rear direction in which the first contact arrangement surface and a first memory contact surface **110***b* of the first memory contact **110***a* extend. For this reason, the first memory contact **110***a* and the first main body memory contact **111***a* can be reliably and electrically connected, and thus the certainty of information transmission can be improved. Further, since the sizes of the first contact arrangement surface and the first memory contact surface **110***b* can be reduced by improving the positioning accuracy, the first memory tag **110** can be miniaturized.

Further, the positioning accuracy between the first memory contact **110***a* and the first main body memory contact **111***a* can be improved in the left to right direction that is the normal direction of the first contact arrangement surface and the first memory contact surface **110***b* of the first memory contact **110***a*. For that reason, since the contact pressure between the first memory contact **110***a* and the first main body memory contact **111***a* can be made appropriate to inhibit damage to the mutual contacts when they are contacted, the certainty of information transmission can be improved.

Sixth Embodiment

Next, a sixth embodiment will be described. In the sixth embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the sixth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIGS. **37** and **38**. FIGS. **37** and **38** are perspective views of the toner cartridge **9** and the cartridge unit **10** from diagonally below. A protruded portion **115** projecting downward is formed on the T side holder L**92** of the toner cartridge **9**. The first memory tag **110** is disposed at a tip of the protruded portion **115** such that the first contact arrangement surface and the first memory contact surface **110***b* of the first memory contact **110***a* face downward. The first memory tag **110** is provided on a left side of the toner cartridge **9**. Further, the toner cartridge **9** is provided with the above-mentioned discharge opening **94**A on the right side of the toner cartridge **9**. Therefore, in the longitudinal direction (axis direction) of the toner cartridge **9**, the discharge opening **94**A is disposed on one end side with respect to the center of the toner cartridge **9**, and the first memory tag **110** is disposed on the other end side opposite to the one end side with respect to the center of the toner cartridge **9**.

FIG. **38** shows a state of the cartridge unit **10** in which the toner cartridge **9** is attached to the process cartridge **5**. The first memory tag **110** is disposed such that the first memory contact **110***a* is exposed to the outside from an opening portion **116** formed in the frame **610** of the process cartridge **5**. As shown in FIG. **38**, the second memory tag **101** and the first memory tag **110** are provided on the left side of the lower surface of the cartridge unit **10**.

Further, an arrangement of the first memory tag **110** will be described with reference to FIG. **39**. FIG. **39** is a cross-sectional view of the cartridge unit **10** from a left side. As described above, the toner cartridge **9** is attached to the process cartridge **5** by rotating the toner cartridge **9** with respect to the process cartridge **5**. The position **9***p* of the toner cartridge **9** before rotation is shown by a dotted line in FIG. **39**. In addition, the rotating direction of the toner cartridge **9** is indicated by arrow S**4** in FIG. **39**. The rotating direction S**4** of the toner cartridge **9** is the attaching direction of the toner cartridge **9** with respect to the process cartridge **5**. FIG. **39** shows the position **9***r* of the toner cartridge **9** when the toner cartridge **9** is rotated and the toner cartridge **9** is attached to the process cartridge **5**. With the toner cartridge **9** in contact with the process cartridge **5**, the toner cartridge **9** moves from the position **9***p* (first position) to the position **9***r* (second position), and the toner cartridge **9** is

positioned on the process cartridge **5**. The position **9***r* (second position) of the toner cartridge **9** when the toner cartridge **9** is positioned with respect to the process cartridge **5** is the fully attached position or the positioning position of the toner cartridge **9** with respect to the process cartridge **5**.

The first memory tag **110** has the first contact arrangement surface on which the first memory contact **110***a* is disposed. The apparatus main body **2** has the first main body memory contact **104***a* that comes into contact with the first memory contact **110***a* when the cartridge unit **10** is attached to the apparatus main body **2**. The first memory contact **110***a* has the first memory contact surface that comes into contact with the first main body memory contact **104***a*. The first memory contact **110***a* has the first memory contact surface **110***b* extending parallel to the front to rear direction and the left to right direction. The first memory contact surface **110***b* of the first memory contact **110***a* may be formed at the same height as the first contact arrangement surface of the first memory tag **110**. There may be a step between the first contact arrangement surface of the first memory tag **110** and the first memory contact surface **110***b* of the first memory contact **110***a*. The first contact arrangement surface of the first memory tag **110** and the first memory contact surface **110***b* of the first memory contact **110***a* are exposed from the opening portion **116** of the process cartridge **5**.

On the first contact arrangement surface, the normal direction M**1** of the first contact arrangement surface and the first memory contact surface **110***b* facing in the direction in which the first memory contact **110***a* is exposed faces in the same direction as the rotating direction S**4**. That is, the first contact arrangement surface and the first memory contact surface **110***b* are disposed to face in the same direction as the direction in which the toner cartridge **9** is attached (rotating direction S**4**). Therefore, the normal direction M**1** of the first contact arrangement surface and the first memory contact surface **110***b* faces in the direction (rotating direction S**4**) in which the toner cartridge **9** is directed from the position **9***p* (first position) to the position **9***r* (second position). In other words, the first contact arrangement surface of the first memory tag **110** and the first memory contact surface **110***b* of the first memory contact **110***a* faces in the direction (rotating direction S**4**) in which the toner cartridge **9** is directed from the position **9***p* (first position) to the position **9***r* (second position).

Next, attaching the cartridge unit **10** on the apparatus main body **2** will be described with reference to FIGS. **39** and **40**. FIG. **40** is a side view showing a relationship between the cartridge unit **10** and an attaching guide. When the cartridge unit **10** is attached to the apparatus main body **2**, as shown in FIG. **39**, the second memory contact **101***a* of the second memory tag **101** is electrically connected to a second main body memory contact **103***a* on the apparatus main body **2** side, and thus transmission of information is performed. Further, when the cartridge unit **10** is attached to the apparatus main body **2**, as shown in FIG. **39**, the first memory contact **110***a* of the first memory tag **110** is electrically connected to the first main body memory contact **104***a* on the apparatus main body **2** side, and thus transmission of information is performed.

In FIG. **40**, the guide groove **106**, which is a guide for attaching the cartridge unit **10** to the apparatus main body **2**, is shown by a dotted line. The positioned protrusions **105***a* and **105***b* provided on the cartridge unit **10** are guided by the guide groove **106**, and the cartridge unit **10** is attached to the apparatus main body **2**. The guide groove **106** is formed in a groove shape through which the positioned protrusions **105***a* and **105***b* can pass and has the upper surface **106***a* and the lower surface **106***b*. An inclined surface **106***f* for guiding the cartridge unit **10** downward as the cartridge unit **10** is attached to a deeper side of the apparatus main body **2** when the cartridge unit **10** is attached is formed on the lower surface **106***b* of the guide groove **106**. By guiding the cartridge unit **10** downward using the inclined surface **106***f* of the guide groove **106**, the second memory contact **101***a* and the first memory contact **110***a* come into contact with the second main body memory contact **103***a* and the first main body memory contact **104***a*, respectively.

Effects of the sixth embodiment will be described below. Effects of the arrangement of the first memory tag **110** in the axis direction will be described. The first memory tag **110** is provided on the side opposite to the discharge opening **94**A of the toner cartridge **9** in the axis direction. This makes it possible to prevent toner contamination of the first memory contact **110***a*.

Next, effects of the arrangement of the first memory tag **110** in the cross-sectional direction perpendicular to the axis direction will be described. The first contact arrangement surface and the first memory contact surface **110***b* are disposed to face in the same direction as the direction in which the toner cartridge **9** is attached (rotating direction S**4**). The frame **610** of the process cartridge **5** to which the toner cartridge **9** is attached is located in the attaching direction of the toner cartridge **9**. The opening portion **116** is formed in the frame **610** in order to expose the first memory contact surface **110***b*, which faces in the attaching direction of the toner cartridge **9**, from the frame **610** to the outside. As described above, the first memory contact surface **110***b* is exposed downward from the cartridge unit **10** so that it can come into contact with the first main body memory contact **104***a* of the apparatus main body **2**.

Further, as described above, the cartridge unit **10** is guided rearward and downward by the attaching guide (guide groove **106**) when attached to the apparatus main body **2** and is attached to the apparatus main body **2**. Since the first memory contact surface **110***b* is disposed on the lower surface of the cartridge unit **10**, the first memory contact surface **110***b* comes into contact with the first main body memory contact **104***a* due to the operation when the cartridge unit **10** is attached. As a result, the first memory contact **110***a* and the first main body memory contact **104***a* can be satisfactorily electrically connected to each other. According to the configuration of the sixth embodiment, since it is unnecessary to provide the apparatus main body **2** with a mechanism for moving the first main body memory contact **104***a* in order to bring the first main body memory contact **104***a* into contact with the first memory contact surface **110***b*, the configuration of the apparatus main body **2** can be simplified.

Seventh Embodiment

Next, a seventh embodiment will be described. In the seventh embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the seventh embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIGS. **41** and **42**. FIGS. **41** and **42** are perspective views of the toner cartridge **9** and the cartridge unit **10** from diagonally below. As shown in FIG. **41**, the first memory tag **110** is disposed on the T side holder L**92** of the

toner cartridge **9** such that the first contact arrangement surface and the first memory contact surface **110***b* of the first memory contact **110***a* face downward. The first memory tag **110** is provided on a left side of the toner cartridge **9**. Further, the toner cartridge **9** is provided with the above-mentioned discharge opening **94**A on a right side of the toner cartridge **9**. Therefore, in the longitudinal direction (axis direction) of the toner cartridge **9**, the discharge opening **94**A is disposed on one end side with respect to the center of the toner cartridge **9**, and the first memory tag **110** is disposed on the other end side opposite to the one end side with respect to the center of the toner cartridge **9**.

As shown in FIG. **42**, the second memory tag **101** is provided on a left side of the lower surface of the cartridge unit **10**. Further, a second relay contact **117***c*, which is electrically connected to the first main body memory contact **104***a* when the cartridge unit **10** is attached to the apparatus main body **2**, is provided on a left side of the lower surface of the cartridge unit **10**. Details of the second relay contact **117***c* will be described later.

Relay Contact of Memory Tag

A relay contact **117** of the memory tag will be described with reference to FIG. **43**. FIG. **43** is a cross-sectional view of the cartridge unit **10**. FIG. **43** shows a state in which the toner cartridge **9** is attached to the developing unit **7** of the process cartridge **5** constituting the cartridge unit **10**, and further shows a state in which the cartridge unit **10** is attached to the apparatus main body **2**. The relay contact **117** is provided in the developing unit **7**. The relay contact **117** has a first relay contact **117***a* that is a connection portion with the first memory contact **110***a*, an extension portion **117***b* extending downward from the first relay contact **117***a*, and the second relay contact **117***c* that is a connection portion with the apparatus main body **2**. The first relay contact **117***a* and the second relay contact **117***c* are electrically connected to each other by the extension portion **117***b*.

The second relay contact **117***c* is disposed such that the second relay contact **117***c* is exposed to the outside from the opening portion **116** formed in the frame **610** of the process cartridge **5**. Thus, the second relay contact **117***c* and the first main body memory contact **104***a* of the apparatus main body **2** can be electrically connected to each other. As described above, the first memory contact **110***a* is electrically connected to the first main body memory contact **104***a* via the relay contact **117**. As a result, information stored in the first memory tag **110** can be transmitted to the apparatus main body **2**.

Effects of the seventh embodiment will be described below. Effects of the arrangement of the first memory contact **110***a* and the relay contact **117** in the axis direction will be described. The first memory contact **110***a* and the relay contact **117** are provided on the side opposite to the discharge opening **94**A of the toner cartridge **9** in the axis direction. As a result, toner contamination of the first memory contact **110***a* and the relay contact **117** can be prevented, and transmission of information to the apparatus main body **2** can be reliably performed.

Next, effects of the arrangement of the second relay contact **117***c* in the cross-sectional direction perpendicular to the axial direction will be described. The second relay contact **117***c* is disposed on the lower surface of the cartridge unit **10**. For that reason, as in the case of the sixth embodiment described above, the second relay contact **117***c* and the first main body memory contact **104***a* can be satisfactorily electrically connected due to the operation when the cartridge unit **10** is attached.

Next, effects of providing the relay contact **117** will be described. In the sixth embodiment described above, the toner cartridge **9** is provided with the protruded portion **115** in order to expose the first memory contact **110***a* disposed in the toner cartridge **9** to the outside through the opening portion **116** formed in the frame **610** of the process cartridge **5**. In addition, the first memory tag **110** is disposed at the tip of the protruded portion **115**. The reason for the arrangement in this way is that the toner cartridge **9** and the opening portion **116** are separated from each other. In the seventh embodiment, since the relay contact **117** is provided between the toner cartridge **9** and the opening portion **116**, it is unnecessary to provide the protruded portion **115** on the toner cartridge **9**, and the toner cartridge **9** can be miniaturized. Further, by miniaturizing the toner cartridge **9**, it is possible to reduce costs including distribution costs of the toner cartridge **9** which is shipped and sold as a single product.

Eighth Embodiment

Next, an eighth embodiment will be described. In the eighth embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the eighth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

An arrangement of the memory tags will be described with reference to FIG. **44**. FIG. **44** is a perspective view of the cartridge unit **10** from diagonally below. As shown in FIG. **44**, the second memory tag **101** is provided on a left side of the lower surface of the cartridge unit **10**. On the other hand, the first memory tag **110** is provided on a right side of the lower surface of the cartridge unit **10**. As in the sixth embodiment, the first memory tag **110** is disposed on the lower surface of the toner cartridge **9** such that the first contact arrangement surface and the first memory contact surface **110***b* face downward. The first contact arrangement surface and the first memory contact surface **110***b* are exposed from the opening portion **116** of the frame **610**. In other words, in the left to right direction, the first memory tag **110** is disposed on one end side with respect to the center of the cartridge unit **10**, and the second memory tag **101** is disposed on the other end side with respect to the center of the cartridge unit **10**. Also, the second memory tag **101** can also be disposed on one end side with respect to the center of the toner cartridge **9**.

According to the eighth embodiment, as in the sixth embodiment, the second memory tag **101** and the first memory tag **110** are disposed on the lower surface of the cartridge unit **10**. Therefore, the second memory contact **101***a* and the first memory contact **110***a* can be satisfactorily electrically connected to the second main body memory contact **103***a* and the first main body memory contact **104***a*, respectively, due to the operation at the time of attaching the cartridge unit **10**. Further, as another configuration relating to the eighth embodiment, the first memory contact **110***a* may be the second relay contact **117***c* as in the seventh embodiment. Also in this way, the information of the first memory tag **110** can be satisfactorily transmitted to the apparatus main body **2**.

Ninth Embodiment

Next, a ninth embodiment will be described. In the ninth embodiment, parts that are different from those of the

above-described embodiments will be described in detail. Unless otherwise specified, the ninth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted.

FIG. **45** is a cross-sectional view of the cartridge unit **10** according to the ninth embodiment. As shown in FIG. **45**, a frame **201** of the photosensitive member unit **6** is provided with a lid member **202**, a waste toner unit **210**, and the corona charging device **68**. The corona charging device **68** includes a wire member **68***a* as a metal member and a frame **68***b* as a metal member, to which different voltage biases are applied from the apparatus main body **2**. The developing unit **7** is provided with the second memory tag **101** as the second storage member, and the toner cartridge **9** is provided with the first memory tag **102** as the first storage member. Here, an assembly in which the developing unit **7** is attached to and integrated with the photosensitive member unit **6** is referred to as the process cartridge **5**.

Through holes **911***b* are provided in side walls of the container member **911** of the toner cartridge **9** on both sides in the left to right direction, and the through holes **911***b* are closed by transparent lid members **920**. The T side holder L**92** and the T side holder R**93** (see FIG. **12**) of the toner cartridge **9** are provided with a holder L through hole **92***g* and a holder R through hole **93***b* (see FIG. **56**), respectively, which are coaxial with the through holes **911***b*.

A configuration of the waste toner unit **210** will be described with reference to FIGS. **46**A and **46**B and FIGS. **47**A and **47**B. FIGS. **46**A and **46**B are perspective views of the waste toner unit **210**. FIGS. **47**A and **47**B are exploded perspective views of the waste toner unit **210**. The waste toner unit **210** includes a waste toner container **212**, a container lid **211**, the recovery roller **62** as a first roller, a stripping roller **250** as a second roller, and a biasing member **240**. The recovery roller **62** has a metal shaft coated with a conductive sponge member as a roller portion. Further, the stripping roller **250** is made of metal with which a shaft portion and a roller portion are all integrated.

Shaft portions of the recovery roller **62** at both ends are supported by a first shaft hole **212***d* and a second shaft hole **212***e* of the waste toner container **212**, and thus the recovery roller **62** is rotatably supported. Further, shaft portions of the stripping roller **250** at both ends are supported by a third shaft hole **212***c* and a fourth shaft hole **212***f* of the waste toner container **212**, and thus the stripping roller **250** is rotatably supported. A surface of the recovery roller **62** and a surface of the stripping roller **250** are in contact with each other (see FIG. **45**). After the recovery roller **62** and the stripping roller **250** are incorporated into the waste toner container **212**, the container lid **211** is fixed to the waste toner container **212**.

A recovery roller gear **232** and a stripping roller gear **231** are fixed to left shafts of the recovery roller **62** and the stripping roller **250**, respectively. Further, a support shaft **212***b* is provided on a left wall of the waste toner container **212**, and a first idler gear **230** is rotatably supported thereon. The first idler gear **230** engages with the photosensitive member gear (first gear) **65** (see FIG. **8**) provided on the photosensitive drum **61** to receive a driving force. The driving force from the photosensitive drum **61** is transmitted to the first idler gear **230**, the stripping roller gear **231** and the recovery roller gear **232** in order, and thus the recovery roller **62** and the stripping roller **250** are rotationally driven.

A recovery roller electrode **220** and a stripping roller electrode **221** formed of a conductive resin are fixed respectively to right shafts of the recovery roller **62** and the stripping roller **250** to be rotatable and slidable. Two fixing protrusions **212***g* are provided on the outside of a rear side wall of the waste toner container **212**, and the biasing member **240** is fixed to each of them. A seal sheet **260** is a sheet-shaped plastic member, which is provided below an opening portion **212***a* of the waste toner container **212**. One end side of the seal sheet **260** is fixed to the waste toner container **212**, and the other end side is in contact with the recovery roller **62**.

Attaching the waste toner unit **210** to the photosensitive member unit **6** will be described with reference to FIG. **48**. FIG. **48** is a perspective view of the photosensitive member unit **6** and the waste toner unit **210**. As shown in FIG. **48**, the waste toner unit **210** is attached through an opening hole **201***a* of the frame **201** of the photosensitive member unit **6**. After that, the lid member **202** is attached to the frame **201**, and the waste toner unit **210** is attached to the photosensitive member unit **6**. The waste toner unit **210** is movably held in a direction of the photosensitive drum **61** by a rail (not shown) provided on the frame **201**. Further, the biasing member **240** comes into contact with a contact wall **201***b* of the frame **201** (see FIG. **45**), and the pressing force thereof biases the recovery roller **62** in the direction of the photosensitive drum **61**, thereby bringing a surface of the recovery roller **62** into contact with the surface of the photosensitive drum **61**.

Predetermined voltages are applied to the recovery roller **62** and the stripping roller **250** from the apparatus main body **2** via the recovery roller electrode **220** and the stripping roller electrode **221**, respectively. The recovery roller **62** collects paper dust and toner adhering to the surface of the photosensitive drum **61**. Further, the stripping roller **250** strips off the paper dust and toner adhering to the surface of the recovery roller **62**. The stripped toner is collected in the waste toner container **212**. The seal sheet **260** prevents the collected toner from leaking from a lower portion of the opening portion **212***a* of the waste toner container **212** and the recovery roller **62**.

FIGS. **49** and **50** are perspective views of the cartridge unit **10** according to the ninth embodiment. As shown in FIG. **49**, the first memory tag **102** is provided on the upper surface of the toner cartridge **9** on the discharge opening **94**A (see FIG. **13**) side. As shown in FIG. **50**, the second memory tag **101** is provided at a lower portion of the developing unit **7** on the developing coupling **710** (see FIGS. **4** and **9**) side.

An arrangement of components of the cartridge unit **10** according to the ninth embodiment will be described with reference to FIGS. **51** to **54**. FIGS. **51** to **54** are cross-sectional views of the cartridge unit **10**. As shown in FIG. **51**, a drum cylinder (aluminum tube) **61***a* of the photosensitive drum **61** and a metal frame **68***a* of the corona charger **68** are provided in a projection range (a range between line segments L**1** and L**2**) from the recovery roller **62** toward an outer contour of the first memory tag **102** in the cross-sectional direction. The aluminum tube **61***a* and the metal frame **68***a* are made of a metal. When viewed in the axis direction, the line segment L**1** is a tangent line (first tangent line) that passes through one end of the first memory tag **102** and is in contact with the recovery roller **62**. The line segment L**2** is a tangent line (second tangent line) that passes through the other end of the first memory tag **102** and is in contact with the recovery roller **62**. The aluminum tube **61***a* of the photosensitive drum **61** and the metal frame **68***a* of the corona charger **68** overlap the region partitioned by or

surrounded by the line segment L**1**, the line segment L**2**, the first memory tag **102**, and the recovery roller **62**.

According to the configuration shown in FIG. **51**, even in a case in which electromagnetic noise is generated from the recovery roller **62** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise toward the first memory tag **102** is electromagnetically shielded by the metal aluminum tube **61***a* and the metal frame **68***a*. For this reason, the electromagnetic noise which is derived from the recovery roller **62** and radiated to the first memory tag **102** is reduced, and thus the operation of the first memory tag **102** is stabilized.

Similarly, as shown in FIG. **51**, the aluminum tube **61***a* is provided in a projection range (a range between line segments L**3** and L**4**) from the recovery roller **62** toward an outer contour of the second memory tag **101** in the cross-sectional direction. When viewed in the axis direction, the line segment L**3** is a tangent line that passes through one end of the second memory tag **101** and is in contact with the recovery roller **62**. The line segment L**4** is a tangent line that passes through the other end of the second memory tag **101** and is in contact with the recovery roller **62**. The aluminum tube **61***a* of the photosensitive drum **61** overlaps the region partitioned by or surrounded by the line segment L**3**, the line segment L**4**, the second memory tag **101**, and the recovery roller **62**. According to the configuration shown in FIG. **51**, even if electromagnetic noise is generated from the recovery roller **62** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the second memory tag **101** is electromagnetically shielded by the metal aluminum tube **61***a*. For this reason, the electromagnetic noise which is derived from the recovery roller **62** and radiated to the second memory tag **101** is reduced, and thus the operation of the second memory tag **101** is stabilized.

As shown in FIG. **52**, the aluminum tube **61***a* is provided in a projection range (a range between line segments L**5** and L**6**) from a contact region N**1** between the recovery roller **62** and the photosensitive drum **61** toward the outer contour of the first memory tag **102** in the cross-sectional direction. The recovery roller **62** comes into contact with the photosensitive drum **61** at the contact region N**1** (a first contact point). When viewed in the axis direction, the line segment L**5** is a straight line (a first straight line) connecting one end of the first memory tag **102** to the contact region N**1**, and the line segment L**6** is a straight line (a second straight line) connecting the other end of the first memory tag **102** to the contact region N**1**. The aluminum tube **61***a* overlaps the region partitioned or surrounded by the line segment L**5**, the line segment L**6**, and the first memory tag **102**. According to the configuration shown in FIG. **52**, even in a case in which electromagnetic noise is generated from the contact region N**1** between the recovery roller **62** and the photosensitive drum **61** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the first memory tag **102** is electromagnetically shielded by the aluminum tube **61***a*. For this reason, the electromagnetic noise which is derived from the contact region N**1** between the recovery roller **62** and the photosensitive drum **61** and radiated to the first memory tag **102** is reduced, and thus the operation of the first memory tag **102** is stabilized.

Similarly, as shown in FIG. **52**, the aluminum tube **61***a* is provided in a projection range (a range between line segments L**7** and L**8**) from the contact region N**1** between the recovery roller **62** and the photosensitive drum **61** toward the outer contour of the second memory tag **101** in the cross-sectional direction. When viewed in the axis direction, the line segment L**7** is a straight line connecting one end of the second memory tag **101** to the contact region N**1**, and the line segment L**8** is a straight line connecting the other end of the second memory tag **101** to the contact region N**1**. The aluminum tubes **61***a* overlaps the region partitioned by or surrounded by the line segment L**7**, the line segment L**8**, and the second memory tag **101**. According to the configuration shown in FIG. **52**, even in a case in which electromagnetic noise is generated from the contact region N**1** between the recovery roller **62** and the photosensitive drum **61** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the second memory tag **101** is electromagnetically shielded by the aluminum tube **61***a*. For this reason, the electromagnetic noise which is derived from the contact region N**1** between the recovery roller **62** and the photosensitive drum **61** and radiated to the second memory tag **101** is reduced, and thus the operation of the second memory tag **101** is stabilized.

As shown in FIG. **53**, the metal frame **68***a* of the corona charger **68** is provided in a projection range (a range between line segments L**9** and L**10**) from the stripping roller **250** toward the outer contour of the first memory tag **102** in the cross-sectional direction. The stripping roller **250** comes into contact with the recovery roller **62**. When viewed in the axis direction, the line segment L**10** is a tangent line (a third tangent line) that passes through one end of the first memory tag **102** and is in contact with the stripping roller **250**, and the line segment L**9** is a tangent line (a fourth tangent line) that passes through the other end of the first memory tag **102** and is in contact with the stripping roller **250**. The metal frame **68***a* of the corona charging device **68** overlaps the region partitioned or surrounded by the line segment L**9**, the line segment L**10**, the first memory tag **102**, and the stripping roller **250**. According to the configuration shown in FIG. **53**, even in a case in which electromagnetic noise is generated from the stripping roller **250** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the first memory tag **102** is electromagnetically shielded by the metal frame **68***a*. For this reason, the electromagnetic noise which is derived from the stripping roller **250** and radiated to the first memory tag **102** is reduced, and thus the operation of the first memory tag **102** is stabilized.

Similarly, as shown in FIG. **53**, the aluminum tube **61***a* is provided in a projection range (a range between line segments L**11** and L**12**) from the stripping roller **250** toward the outer contour of the second memory tag **101** in the cross-sectional direction. When viewed in the axis direction, the line segment L**11** is a tangent line that passes through one end of the second memory tag **101** and is in contact with the stripping roller **250**, and the line segment L**12** is a tangent line that passes through the other end of the first memory tag **102** and is in contact with the stripping roller **250**. The aluminum tube **61***a* overlaps the region partitioned or surrounded by the line segment L**11**, the line segment L**12**, the second memory tag **101**, and the stripping roller **250**. According to the configuration shown in FIG. **53**, even in a case in which electromagnetic noise is generated from the stripping roller **250** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the second memory tag **101** is electromagnetically shielded by the aluminum tube **61***a*. For this reason, the electromagnetic noise which is derived from the stripping roller **250** and radiated to the second memory tag **101** is reduced, and thus the operation of the second memory tag **101** is stabilized.

As shown in FIG. **54**, the metal frame **68***a* is provided in a projection range (a range between line segments L**13** and L**14**) from a contact region N**2** between the stripping roller **250** and the recovery roller **62** toward the outer contour of the first memory tag **102** in the cross-sectional direction. The stripping roller **250** comes into contact with the recovery roller **62** at the contact region N**2** (a second contact point). When viewed in the axis direction, the line segment L**13** is a straight line (a third straight line) connecting one end of the first memory tag **102** to the contact region N**2**, and the line segment L**14** is a straight line (a fourth straight line) connecting the other end of the first memory tag **102** to the contact region N**2**. The metal frame **68***a* overlaps the region partitioned by or surrounded by the line segment L**13**, the line segment L**14**, and the first memory tag **102**. According to the configuration shown in FIG. **54**, even in a case in which electromagnetic noise is generated from the contact region N**1** between the stripping roller **250** and the recovery roller **62** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the first memory tag **102** is electromagnetically shielded by the metal frame **68***a*. For this reason, the electromagnetic noise which is derived from the contact region N**2** between the stripping roller **250** and the recovery roller **62** and radiated to the first memory tag **102** is reduced, and the thus operation of the first memory tag **102** is stabilized.

Similarly, as shown in FIG. **54**, the aluminum tube **61***a* is provided in a projection range (a range between line segments L**15** and L**16**) from the contact region N**2** between the stripping roller **250** and the recovery roller **62** toward the outer contour of the second memory tag **101** in the cross-sectional direction. When viewed in the axis direction, the line segment L**15** is a straight line connecting one end of the first memory tag **102** to the contact region N**2**, and the line segment L**16** is a straight line connecting the other end of the first memory tag **102** to the contact region N**2**. The aluminum tube **61***a* overlaps the region partitioned or surrounded by the line segment L**15**, the line segment L**16**, and the first memory tag **102**. According to the configuration shown in FIG. **54**, even in a case in which electromagnetic noise is generated from the contact region N**2** between the stripping roller **250** and the recovery roller **62** to which electric power is supplied from the apparatus main body **2**, the electromagnetic noise directed to the second memory tag **101** is electromagnetically shielded by the aluminum tube **61***a*. For this reason, the electromagnetic noise which is derived from the contact region N**2** between the stripping roller **250** and the recovery roller **62** and radiated to the second memory tag **101** is reduced, and thus the operation of the second memory tag **101** is stabilized.

An arrangement of components of the cartridge unit **10** according to the ninth embodiment will be described with reference to FIG. **55**. FIG. **55** is a diagram of the cartridge unit **10** when viewed from above. In FIG. **55**, some components are omitted for convenience of explanation. As shown in FIG. **55**, the first memory tag **102** is disposed inward (in a range indicated by arrow W**1** in FIG. **55**) from both end portions of the aluminum tube **61***a* of the photosensitive drum **61** in the axis direction (left to right direction of the cartridge unit **10**). Similarly, the first memory tag **102** is disposed inward (in a range indicated by arrow W**2** in FIG. **55**) from both end portions of the metal frame **68***a* of the corona charging device **68** in the axis direction.

Further, the roller portions of the recovery roller **62** and the stripping roller **250** are disposed inward (in the range indicated by the arrow W**1** in FIG. **55**) from both end portions of the aluminum tube **61***a* of the photosensitive drum **61**. Similarly, they are disposed inward (in the range of arrow W**2** in FIG. **55**) from both end portions of the metal frame **68***a* of the corona charging device **68**. With this configuration, electromagnetic shielding is performed against electromagnetic noise radiation from all positions in the left to right direction, such as from the recovery roller **62** and the stripping roller **250** and from the contact regions N**1** and N**2** of the respective rollers, toward the first memory tag **102** described above. For this reason, the operation of the first memory tag **102** is stable.

The second memory tag **101** may be disposed at a position similar to the position of the first memory tag **102** in the left to right direction. With this configuration, electromagnetic shielding is performed against electromagnetic noise radiation from all positions in the left to right direction such as from the recovery roller **62** and the stripping roller **250** and from the contact regions N**1** and N**2** of the respective rollers. For this reason, the operation of the second memory tag **101** is stable.

Here, a configuration for detecting an amount of toner in the toner cartridge **9** will be described. As shown in FIG. **48**, the side holder **719** of the developing unit **7** is provided with a side holder through hole **719***b*, and the receiving port cover **774** is provided with a receiving port cover through hole **774***d*. FIG. **56** is a schematic cross-sectional view of a toner amount detection unit of the cartridge unit **10** in the left to right direction. The side holder through hole **719***b*, the receiving port cover through hole **774***d*, the through holes **911***b* of the container member **911** (see FIG. **45**), the holder L through hole **92***g*, and the holder R through hole **93***b* are coaxially disposed in the left to right direction in FIG. **56**. When the cartridge unit **10** is attached to the apparatus main body **2**, a light emitting element **280** is provided on one end side of the toner container **910**, and a light receiving element **281** is provided on the other end side of the toner container **910**. Light from the light emitting element **280** passes through the toner container **910** of the toner cartridge **9** and is detected by the light receiving element **281**.

An amount of light detected by the light receiving element **281** and a change in the amount of light over time vary depending on an amount of residual toner T agitated in the toner container **910**. The amount of residual toner T in the toner cartridge **9** can be detected by changing detection light of the light receiving element **281**. According to this configuration, when the amount of toner in the toner cartridge **9** becomes low, the user can be notified and replacement of the toner cartridge **9** can be prompted. Further, the first memory tag **102** stores information related to the amount of toner T accommodated in the toner cartridge **9**.

Tenth Embodiment

Next, a tenth embodiment will be described. In the tenth embodiment, parts that are different from those of the above-described embodiments will be described in detail. Unless otherwise specified, the tenth embodiment has the same configuration as each embodiment, and thus the same components as those in each embodiment will be denoted by the same reference numerals, and detailed description thereof will be omitted. In the tenth embodiment, the arrangement of the first memory tag **102** of the ninth embodiment is changed.

FIG. **57** is a perspective view of the cartridge unit **10** according to the tenth embodiment. As shown in FIG. **57**, in the up and down direction, the first memory tag **102** is provided on the upper surface of the toner cartridge **9** on a side opposite to a side on which the discharge opening **94**A

(see FIG. **13**) of the toner cartridge **9** is disposed. The position of the first memory tag **102** in the cross-sectional direction is the same as that of the ninth embodiment (see FIGS. **51** to **54**). With this configuration, when the user attaches and detaches the toner cartridge **9** to and from the process cartridge **5**, it is possible to prevent the first memory tag **102** from being contaminated by the toner scattered from the discharge opening **94**A. By doing so, it is possible to prevent information transmission between the first memory tag **102** and the apparatus main body **2** from becoming unstable due to toner contamination of the first memory contact **102***a*. Further, since the arrangement of the components in the cross-sectional direction is the same as that of the ninth embodiment, electromagnetic shielding is performed against electromagnetic noise radiation from the recovery roller **62** and the stripping roller **250**.

Further, in the tenth embodiment, the first memory tag **102** is provided on the side opposite to the recovery roller electrode **220** (see FIG. **48**) and the stripping roller electrode **221** (see FIG. **48**) in the left to right direction (axis direction). Electrodes (not shown) of the apparatus main body **2** come into contact with the recovery roller electrode **220** and the stripping roller electrode **221**, and thus a power supply unit receives electric power supplied to the recovery roller **62** and the stripping roller **250** from the apparatus main body **2**. The power supply unit is provided on a side opposite to the first memory tag **102** in the left to right direction (axis direction). In the axis direction, the power supply unit is disposed on one end side with respect to the center of the cartridge unit **10**, and the first memory tag **102** is disposed on the other end side opposite to the one end side with respect to the center of the cartridge unit **10**. With this configuration, a distance between the power supply unit and the first memory tag **102** can be increased. By doing so, even in a case in which electromagnetic noise is generated at electrode contact regions, a distance from a generation source to the first memory tag **102** is increased, and thus the influence of electromagnetic noise on the first memory tag **102** can be reduced. Therefore, the operation of the first memory tag **102** is stable.

According to the present invention, in a case in which a toner cartridge includes a storage member, the storage member can be appropriately disposed.

As described above, the present application includes the following configurations.

(Configuration 1)

A cartridge unit comprising:

a first unit which includes a photosensitive drum, a developing roller, a first supporting portion, and a second supporting portion; and

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first supported portion supported by the first supporting portion, a second supported portion supported by the second supporting portion, and a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed,

wherein the second unit is configured to rotate from a first position to a second position in a state in which the first supported portion is supported by the first supporting portion and the second supported portion is supported by the second supporting portion so that the second unit is positioned with respect to the first unit,

the second unit rotate from the first position to the second position such that the first supported portion and the second supported portion are rotation centers of the second unit, and

a normal direction of the first contact arrangement surface faces toward a direction in which the first memory contact is exposed, the normal direction of the first contact arrangement surface faces toward a direction opposite to a direction in which the second unit is directed from the first position to the second position.

(Configuration 2)

The cartridge unit according to configuration 1,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit, and

the developer discharge opening and the first storage member are disposed on one end side with respect to a center of the second unit in a longitudinal direction of the second unit.

(Configuration 3)

The cartridge unit according to configuration 2,

wherein the first unit includes an operation member which moves the second unit in a direction in which the second unit is detached from the first unit, and

the operation member is disposed on the other end side opposite to the one end side with respect to the center of the second unit in the longitudinal direction of the second unit.

(Configuration 4)

The cartridge unit according to configuration 1,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit,

the developer discharge opening is disposed on one end side with respect to a center of the second unit in a longitudinal direction of the second unit, and

the first storage member is disposed on the other end side opposite to the one end side with respect to the center of the second unit.

(Configuration 5)

A cartridge unit which is attachable to and detachable from an apparatus main body of an image forming apparatus, the apparatus main body including a positioning portion and a rotation restricting portion, the cartridge unit comprising:

a first unit which includes a photosensitive drum and a developing roller;

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed;

a positioned portion which comes into contact with the positioning portion; and

a rotation restricted portion which comes into contact with the rotation restricting portion and restricts rotation around the positioned portion,

wherein the first contact arrangement surface faces toward a direction opposite to a direction in which the rotation restricted portion is pressed against the rotation restricting portion.

(Configuration 6)

The cartridge unit according to configuration 5,

wherein the second unit has a developer discharge opening for discharging the developer to the first unit, and

the developer discharge opening and the first storage member are disposed on one end side with respect to a center of the second unit in a longitudinal direction of the second unit.

(Configuration 7)

The cartridge unit according to configuration 6, further comprising a support member provided in the first unit in order to support the second unit on the first unit,

wherein the support member is disposed on the other end side opposite to the one end side with respect to the center of the second unit in the longitudinal direction of the second unit.

(Configuration 8)

The cartridge unit according to configuration 5,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit,

the developer discharge opening is disposed on one end side with respect to the center of the second unit in a longitudinal direction of the second unit, and

the first storage member is disposed on the other end side opposite to the one end side with respect to the center of the second unit.

(Configuration 9)

The cartridge unit according to configuration 5, wherein a distance between the first memory contact and the positioned portion is longer than a distance between the positioned portion and the rotation restricted portion.

(Configuration 10)

The cartridge unit according to any one of configurations 1 to 9, wherein the first storage member is disposed on a top surface of the second unit in a posture in which the cartridge unit is used.

(Configuration 11)

A cartridge unit attachable to and detachable from an apparatus main body of an image forming apparatus, the cartridge unit comprising:

a first unit which includes a photosensitive drum and a developing roller; and

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed,

wherein the second unit is configured to be attachable to and detachable from the apparatus main body in a state in which the second unit is attached to the first unit,

the second unit includes an end surface at an end portion of the second unit in a rotational axis direction of the developing roller, the end surface extends in a direction crossing the rotational axis direction of the developing roller, and

the first storage member is disposed on the end surface.

(Configuration 12)

The cartridge unit according to configuration 11, wherein the first memory contact is disposed at a position protruding the most outward in the rotational axis direction.

(Configuration 13)

The cartridge unit according to configuration 11,

wherein the apparatus main body includes a main body memory contact which comes into contact with the first memory contact when the cartridge unit is attached to the apparatus main body, and

the second unit includes a positioning portion which determines a position of the main body memory contact.

(Configuration 14)

The cartridge unit according to configuration 11,

wherein the second unit includes a first frame, and a supporting portion which supports the first storage member and is movable with respect to the first frame, and

when the rotational axis direction is defined as a first direction, a direction perpendicular to the first direction is defined as a second direction, and a direction perpendicular to the first direction and the second direction is defined as a third direction, the supporting portion is configured to be movable in each direction of the first direction, the second direction, and the third direction with respect to the first frame.

(Configuration 15)

A cartridge unit including:

a first unit which includes a photosensitive drum, and a developing roller; and

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, a first memory contact electrically connected to the first storage element, and a first contact arrangement surface on which the first memory contact is disposed,

wherein the second unit is configured to move from a first position to a second position so that the second unit is positioned with respect to the first unit in a state in which the second unit is in contact with the first unit,

the first contact arrangement surface faces toward a direction in which the second unit is directed from the first position to the second position, and

the first unit includes an opening portion which exposes the first contact arrangement surface.

(Configuration 16)

The cartridge unit according to configuration 15,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit, and

in a longitudinal direction of the second unit, the developer discharge opening is disposed on one end side with respect to a center of the second unit, and the first storage member is disposed on the other end side opposite to the one end side with respect to the center of the second unit.

(Configuration 17)

The cartridge unit according to configuration 15,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit, and

in a longitudinal direction of the second unit, the developer discharge opening and the first storage member are disposed on one end side with respect to a center of the second unit.

(Configuration 18)

The cartridge unit according to any one of configurations 15 to 17, wherein the first storage member is disposed on a bottom surface of the second unit in a posture when the cartridge unit is used.

(Configuration 19)

The cartridge unit according to any one of configurations 1 to 18,

wherein the first unit includes a second storage member that stores information, and

the second storage member includes a second storage element and a second memory contact electrically connected to the second storage element.

(Configuration 20)

The cartridge unit according to configuration 19,

wherein the first storage member is disposed on one end side with respect to a center of the cartridge unit in a longitudinal direction of the cartridge unit, and

the second storage member is disposed on the other end side opposite to the one end side with respect to the center of the cartridge unit.

(Configuration 21)

A cartridge unit including:

a first unit which includes a photosensitive drum, a developing roller, a metal member, a transfer roller, and a first roller that comes into contact with the photosensitive drum; and

a second unit which is configured to be attachable to and detachable from the first unit, the second unit including a first storage member that stores information, and the second unit configured to supply developer to the first unit, the first storage member including a first storage element, and a first memory contact electrically connected to the first storage element,

wherein when viewed in an axis direction of the photosensitive drum and when a tangent line which passes through one end of the first storage member and is in contact with the first roller is defined as a first tangent line and a tangent line which passes through the other end of the first storage member and in contact with the first roller is defined as a second tangent line, at least a part of the metal member or the photosensitive drum overlaps a region surrounded by the first tangent line, the second tangent line, the first storage member, and the first roller.

(Configuration 22)

The cartridge unit according to configuration 21,

wherein the first roller comes into contact with the photosensitive drum at a first contact point, and

when viewed in an axis direction of the photosensitive drum and when a straight line which connects the one end of the first storage member to the first contact point is defined as a first straight line and a straight line which connects the other end of the first storage member to the first contact point is defined as a second straight line, at least a part of the metal member or the photosensitive drum overlaps a region surrounded by the first straight line, the second straight line, and the first storage member.

(Configuration 23)

The cartridge unit according to configuration 21 or 22, further including a second roller which comes into contact with the first roller,

wherein when viewed in the axis direction of the photosensitive drum and a tangent line which passes through one end of the first storage member and is in contact with the second roller is defined as a third tangent line and a tangent line which passes through the other end of the first storage member and in contact with the first roller is defined as a fourth tangent line, at least a part of the metal member or the photosensitive drum overlaps a region surrounded by the third tangent line, the fourth tangent line, the first storage member, and the second roller.

(Configuration 24)

The cartridge unit according to configuration 23,

wherein the second roller comes into contact with the first roller at a second contact point, and

when viewed in the axis direction of the photosensitive drum and a straight line which connects the one end of the first storage member and the second contact point is defined as a third straight line and a straight line which connects the other end of the first storage member and the second contact point is defined as a fourth straight line, at least a part of the metal member or the photosensitive drum overlaps a region surrounded by the third straight line, the fourth straight line, and the first storage member.

(Configuration 25)

The cartridge unit according to any one of configurations 21 to 24, wherein the first storage member is provided inward from a corona charging device or both end portions of the photosensitive drum in the axis direction of the photosensitive drum.

(Configuration 26)

The cartridge unit according to any one of configurations 21 to 25,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit, and

in a longitudinal direction of the second unit, the developer discharge opening and the first storage member are disposed on one end side with respect to a center of the second unit.

(Configuration 27)

The cartridge unit according to any one of configurations 21 to 25,

wherein the second unit includes a developer discharge opening for discharging the developer to the first unit, and

in a longitudinal direction of the second unit, the developer discharge opening is disposed on one end side with respect to a center of the second unit, and the first storage member is disposed on the other end side opposite to the one end side with respect to the center of the second unit.

(Configuration 28)

The cartridge unit according to any one of configurations 21 to 25, further comprising a power supply portion which receives electric power supplied to the first roller from the apparatus main body,

wherein in the axis direction of the photosensitive drum, the power supply portion is disposed on one end side of the cartridge unit, and the first storage member is disposed on the other end side of the cartridge unit.

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application No. 2019-239498, filed on Dec. 27, 2019, and Japanese Patent Application No. 2020-196038, filed on Nov. 26, 2020 which are hereby incorporated by reference herein in their entirety.

What is claimed is:

1. A cartridge unit attachable to and detachable from an apparatus main body, including a main body contact, of an image forming apparatus, the cartridge unit comprising:

a first unit including a photosensitive drum and a developing roller; and

a second unit including a locked protrusion and a rotation portion, and configured to be:

attachable to and detachable from the first unit and supply developer to the first unit in a state where the second unit is attached to the first unit, wherein the second unit is configured to be attached to the first unit by rotating relative to the first unit; and

attachable to and detachable from the apparatus main body in the state where the second unit is attached to the first unit,

wherein the second unit includes:

an end surface, which is at an end portion of the second unit with respect to a rotational axis direction of the developing roller, extending in a direction crossing the rotational axis direction of the developing roller; and

a first storage member that stores information,

wherein the first storage member is disposed on the end surface, and includes:

a first storage element; and

a first memory contact electrically connected to the first storage element,

wherein, in the state where the second unit is attached to the first unit and in a state where the second unit is attached to the apparatus main body, the first memory contact directly contacts the main body contact,

wherein, in the state where the second unit is attached to the first unit and in a state where the locked protrusion is fixed to the first unit, the rotation portion is rotatable relative to the locked protrusion, and

wherein the first storage member is disposed in the rotation portion.

2. The cartridge unit according to claim **1**, wherein the first memory contact is disposed at a position protruding the most outward in the rotational axis direction.

3. The cartridge unit according to claim **1**, wherein the second unit includes a positioning portion that determines a position of the main body contact.

4. The cartridge unit according to claim **1**, wherein the second unit includes:

a first frame; and

a supporting portion that supports the first storage member and is movable with respect to the first frame.

5. The cartridge unit according to claim **4**, wherein:

the second unit includes a pressing member configured to press the supporting portion, and

the pressing member is disposed between the first frame and the supporting portion.

6. The cartridge unit according to claim **5**, wherein the pressing member is a compression spring.

7. The cartridge unit according to claim **4**, wherein, in a state where the rotational axis direction is defined as a first direction, a direction perpendicular to the first direction is defined as a second direction, and a direction perpendicular to the first direction and the second direction is defined as a third direction, the supporting portion is configured to be movable in each of the first direction, the second direction, and the third direction with respect to the first frame.

8. The cartridge unit according to claim **4**, the first storage member supported by the supporting portion is exposed to outside through a hole portion formed in the first frame.

9. The cartridge unit according to claim **1**, wherein:

the first unit includes a receiving port and a first shutter,

the second unit includes a discharging opening and a second shutter, and

the first shutter and the second shutter move in conjunction with attachment of the second unit to the first unit so that the receiving port and the discharging opening are opened.

10. The cartridge unit according to claim **1**, wherein the first unit includes a second storage member that stores information.

11. The cartridge unit according to claim **10**, wherein the second storage member is disposed on a lower surface of the first unit.

12. The cartridge unit according to claim **10**, wherein, with respect to the rotational axis direction of the developing roller, the first storage member is disposed on one end side with respect to a center of the cartridge unit, and the second storage member is disposed on the other end side opposite to the one end side with respect to the center of the cartridge unit.

13. The cartridge unit according to claim **11**, wherein, with respect to the rotational axis direction of the developing roller, the first storage member is disposed on one end side with respect to a center of the cartridge unit, and the second storage member is disposed on the other end side opposite to the one end side with respect to the center of the cartridge unit.

14. The cartridge unit according to claim **1**, wherein the first memory contact includes electrical contacts that are aligned along a rotation direction of the second unit relative to the first unit.

15. The cartridge unit according to claim **1**, wherein the first memory contact includes electrical contacts that are aligned along a direction orthogonal to an attaching direction of the cartridge unit to the apparatus main body.

16. The cartridge unit according to claim **1**, wherein:

the first unit includes a developing contact electrically connected to the developing roller, and

a top end of the first memory is higher than a top end of the developing contact in a state where the cartridge unit is attached to the apparatus main body.

17. The cartridge unit according to claim **1**, wherein:

the first unit includes a developing contact electrically connected to the developing roller,

with respect to the rotational axis direction of the developing roller, the first storage member and the developing contact are disposed on one end side with respect to a center of the cartridge unit.

18. The cartridge unit according to claim **1**, wherein:

the first unit includes:

a developing unit including the developing roller; and

a drum frame supporting the developing unit and including a first side wall and a second side wall,

the developing unit is located between the first side wall and a second side wall in the rotational axis direction, and

the first memory is located above the first side wall in a state where the cartridge unit is attached to the apparatus main body.

19. A cartridge unit attachable to and detachable from an apparatus main body, including a main body contact, of an image forming apparatus, the cartridge unit comprising:

a first unit including a photosensitive drum and a developing roller; and

a second unit configured to be:

attachable to and detachable from the first unit and supply developer to the first unit in a state where the second unit is attached to the first unit; and

attachable to and detachable from the apparatus main body in the state where the second unit is attached to the first unit,

wherein the second unit includes:

an end surface, which is at an end portion of the second unit with respect to a rotational axis direction of the developing roller, extending in a direction crossing the rotational axis direction of the developing roller; and

a first storage member that stores information,

wherein the first storage member is disposed on the end surface, and includes:

a first storage element; and

a first memory contact electrically connected to the first storage element,

wherein, in the state where the second unit is attached to the first unit and in a state where the second unit is

attached to the apparatus main body, the first memory contact directly contacts the main body contact,

wherein the first unit includes a developing contact electrically connected to the developing roller, and

wherein a top end of the first memory is higher than a top end of the developing contact in a state where the cartridge unit is attached to the apparatus main body.

20. The cartridge unit according to claim **19**, wherein the second unit is configured to be attached to the first unit by rotating relative to the first unit.

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